FEDERAL TRANSIT FUNDING IMPLICATIONS OF URBANIZATION: A NATIONWIDE ASSESSMENT

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FEDERAL TRANSIT FUNDING IMPLICATIONS OF URBANIZATION: A NATIONWIDE ASSESSMENT

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LIST OF SYMBOLS AND ABBREVIATIONS

UC	Urban Cluster
UA	Urbanized Area
FTA	Federal Transit Administration
§	“Section”

SUMMARY

Between 2000 and 2010, the percentage of the US population residing in urban areas increased by over 12% (US Census Bureau 2011). Using variables to predict urbanization (proximity and economic variables, among others) and population projections, we expect the results of the 2020 decennial census to demonstrate the same trend. This thesis research will examine how the growth of Urbanized Areas in the United States will impact funding for rural transit through the FTA § 5311 formula funding program after the 2020 Census.

Transit agencies in the US receive federal funding based on their urban classification, as defined by the US decennial census. Larger geographic areas, for these purposes, can either be classified as non-urbanized or urbanized, depending on the population density of the comprised census tracts. Within the urbanized category, there are small urban and large urban areas. Due to the geographic expansion of metropolitan areas, many cities and counties that were classified as non-urbanized in the 2010 Census could become enveloped into “large urban” areas (this occurs through outward growth). Rural transit agencies that shift to large urban would lose their ability to use federal funding for operating expenses (FTA 2015). This is because 50% of federal transit funding for rural systems can be used to cover operating expenses, while no portion of federal funding urban systems can be applied to operations (FTA 2015). The loss of operations funding could be challenging for rural transit systems, especially for those that do not receive any local funding support.

A model has already been produced to identify the areas in Georgia that will likely shift from rural to large urban after the 2020 Census (Nord, 2018 & Douthat, Garrow, Nord, 2018). This research will attempt to extend this model to conduct a national-level assessment for the same issue. The applications of this research are to 1) prepare state Departments of Transportation for shifts in federal rural transit funding; and 2) drive policy change to promote regulatory reform that more fully considers the "trending urban" issue when considering federal funding for transit operating expenses.

CHAPTER 1. INTRODUCTION

This thesis explores the implications of urbanization in the United States on federal funding for public transit. Particularly, this thesis concerns urbanizing rural areas and how public transit funding through the Federal Transit Administration's (FTA) § 5311 and § 5307 formula funding programs will be affected as a result of this urbanization. Transit systems located in fast growing non-urbanized areas, and non-urbanized areas that are subject to envelopment by adjacent urbanized areas are the focus for this analysis. The funding implications of urbanization include shifts in overall rural transit funding by state, a reduced number of permitted expenses for the transit agencies (i.e. a loss in operating expenses, such as fuel or operator salaries), and increased reporting requirements to the National Transit Database (NTD) (FTA 2015). These implications have the power to present serious challenges to current rural transit systems that will be located in newly urbanized areas after the 2020 Census.

This research brings a national-level scope to previous research on trending urban areas in Georgia (Douthat, Garrow, & Nord 2018). The Georgia urbanization model accurately predicted urbanization between 2000 and 2010 94.4% of the time (Douthat, et. al 2018), and a similar accuracy percentage was obtained for the regression models used in this analysis. The introductory chapter of the thesis explores urbanization trends in the US since 2000, clarifies definitions of 'urban' and 'rural', provides background on FTA's § 5311 and § 5307 formula funding programs, and the allocation process for each, The introduction concludes with the research problem statement and objectives, the technical approach, key findings, and a brief outline of the thesis. To date, very few research

publications have explored the intersection of urbanization of rural areas and federal funding for transit. As such, it is my hope that the research findings presented in this analysis will be useful in highlighting issues urbanization can have on FTA rural transit funding.

1.1 **Urbanization in the United States**

In the first decade of the twenty-first century, total population in the US grew by 9.7% between (US Census Bureau 2011). Additionally, the overall *urbanized* population in the US grew by 1.7% from 79% to 80.7%, meaning rural population decreased from 21% to 19.3%. Also during this decade, there was a 19% increase in overall urbanized land area (US Census Bureau 2015). Maps showing the distribution of urbanized population and land area in 2010 are illustrated in Figures 1 and 2, respectively. The states with the highest percentage of urbanized population include New Jersey (92%), Rhode Island (90%), Massachusetts (90%), and California (90%), with Vermont (17%), Wyoming (25%), Montana (26%), and Maine (26%) as the states with the lowest percentage of urbanized population. The percent of urbanized land area by state is markedly lower than urbanized population, meaning that urbanized population is concentrated to geographic areas within the state. Urbanized land area ranges from less than 1% in 8 western states to 38% in New Jersey and Rhode Island.

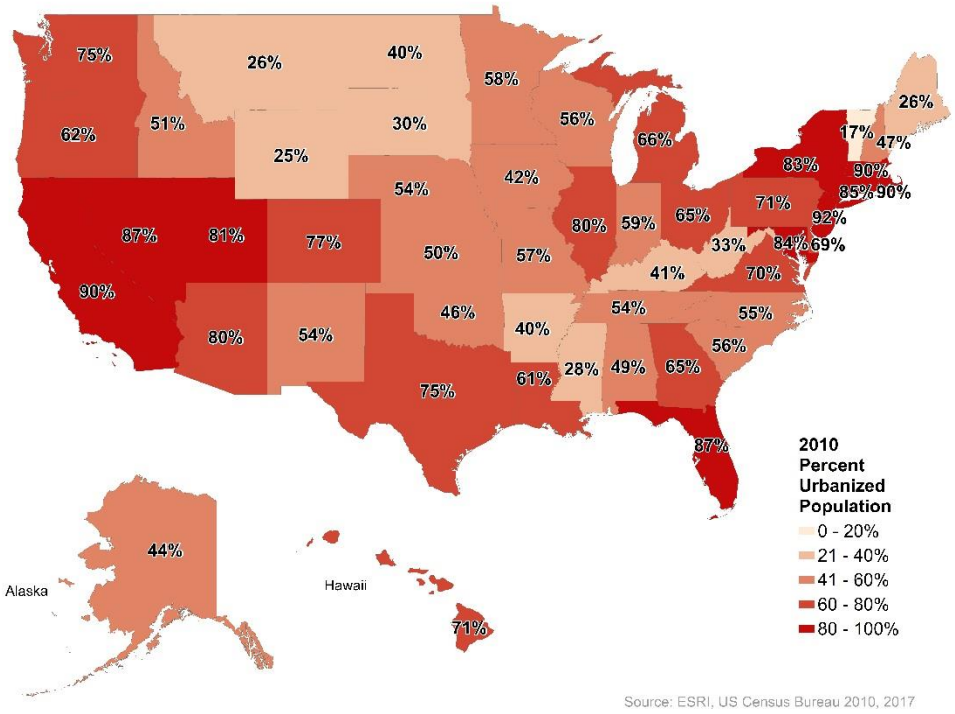


Figure 1 – Percent Urbanized Population in 2010 by State in the US. Data Source: U.S. Census Bureau 2010

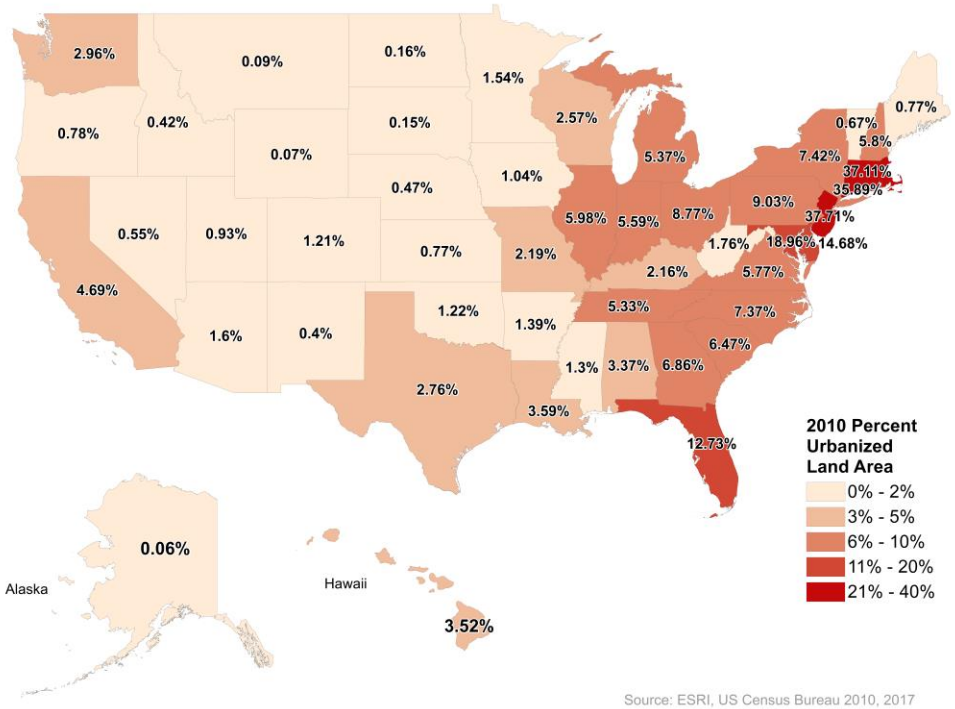


Figure 2 – Percent Urbanized Land Area in 2010 by State in the US. Data Source: U.S. Census Bureau 2010

This trend of urbanization in the US in not new, in fact, the US has been urbanizing since 1830, with a short respite between 1930-1940 (Boustan, Buten, Hearey 2013). The premise of this thesis is predicated on these urbanization trends continuing through 2020 and beyond. As such, it is hypothesized that the 2020 Census is likely to reflect these trends through increased urbanized population and land area. This thesis seeks to predict the changes in urbanized population and land area that will be reflected in the 2020 decennial census. The percent changes in both realms are compared to a 2010 base period.

1.2 **Background**

1.2.1 Defining Urban and Rural Areas

'Urban' and 'rural' areas in the US are defined differently across government agencies. This thesis focuses on US Census Bureau's definitions of 'urban' and 'rural' and the Federal Transit Administration's (FTA's) modified versions of these definitions (49 U.S.C. 5307). The US Census Bureau classifies blocks as urban if the population density of the block is either 1,000 people per square mile or 500 people per square mile and close to an urban core (Urban Area Criteria, 2011). A block that does not meet these population density thresholds is considered to be rural. Counties are also classified as either "mostly urban" or "mostly rural" by the Census. Any county with at least an 89% urban population (or 11% rural population) is considered to be mostly urban (Ratcliffe et al. 2016). Urbanization from a county standpoint will be discussed in later sections.

An agglomeration of urban blocks constitutes an urban area. Urbanized areas are then sub-classified into two groups: Urban Clusters (areas with 2,500 to under 50,000 people; referred to in this thesis as 'UC') and Urbanized Areas (areas with 50,000 or more people; referred to in this thesis as 'UA') through the use of population densities, land uses, and distance to surrounding urban areas (Urban Area Criteria, 2011). Any area that is not classified as either a UC or UA is deemed to be rural by the Census. It is important to note that urban and rural areas do not follow regional political boundaries, like city, county, or even MSA borders. This means that geographic units larger than Census blocks, e.g. tracts or municipalities, can contain of mix of urban and urbanized, as well rural and non-urbanized population.

FTA uses the Census's definitions as a base for determining eligibility for § 5311 and § 5307 formula programs. There are two main differences between the Census's and FTA's urban and rural classifications. Firstly, whereas the Census considers UCs to be urban, the FTA deems UCs as non-urbanized (or rural) entities. Secondly, FTA further classifies UAs into two categories – Small Urban (50,000 to less than 200,000 people) and Large Urban (200,000 people or greater). FTA funding programs also distinguish UAs with a population over 1 million. Additionally, the FTA uses the abbreviation 'UZA' in reference to Urbanized Areas, rather than 'UA' as the Census uses. These classifications are important in determining funding eligibility through the Urbanized Area Formula program (49 U.S.C. 5307) and the Formula Grants for Rural Areas (49 U.S.C 5311), which dictates eligible expenses by transit providers. Hereinafter, these formula programs will be referred to as § 5307 and § 5311, respectively.

1.2.2 FTA § 5311 & § 5307 Funding Formulas

The FTA provides funding for public transit systems through the Fixing America's Surface Transportation (FAST) Act, signed into law in 2015 (FTA n.d.). Through the FAST Act, eligible entities can apply for 27 different competitive or formula grants (FTA n.d.). The population and land area data used in determining apportionment for § 5311 and § 5307 funding recipients comes from the most recent decennial census. So, the apportionment for FY18 for all recipients is based on total urbanized and non-urbanized population and land area from the 2010 Census.

Eligible recipients for § 5307 (UA) funding include urban transit systems that are located in an urbanized area with a population of at least 50,000 or more. A transit system is classified serving an urbanized area if it provides service to an area with a population of at least 50,000. Whereas any area with a population of at least 50,000 is eligible to receive § 5307 funding, the allocation of funding differs based on if an area is small urban (50,000 to under 200,000 people) or large urban (200,000 people or more) (Urban Area Criteria 2011). This point will be further discussed in the following section.

As for § 5311 (Non-Urbanized Area), which is often referred to as rural, funding, eligible recipients include non-urbanized areas (population less than 50,000) that operate transit service; these areas include Census designated rural areas (or an area with less than 2,500 people) and UCs. The allocation for the § 5311 program differs from the § 5307 program, which will be discussed later on. So, in summary, eligible FTA funding recipients for § 5311 and § 5307 fall under one of four categories: rural (non-urbanized), small urban, large urban, or mixed-funding recipient (a transit agency that receives funding from both formulas). The next section explains how funding through these formulas is apportioned and then allocated to transit service providers

1.2.3 5311 & 5307 Apportionment and Allocation

The main difference between the § 5311 and § 5307 formulas is in the way funds are apportioned to the transit agency and the allowable uses for the funding (Urban Area Criteria 2011). For the § 5311 formula, funds from FTA are apportioned to the state governor according to the state's national portion of non-urbanized population and land area. Eighty percent (80%) of the state's apportionment is based on the state's national share of non-urbanized land area, whereas the remaining 20% is based on its national share of non-urbanized population. Similar to § 5311 funds, small urban § 5307 funds are also apportioned to state governors based on urbanized population, population density, and low-income population (FTA n.d.). Small urban § 5307 recipients can also receive additional funding through the Small Transit Intensive City (STIC) provision. Large urban § 5307 funds are apportioned to either the Metropolitan Planning Organization (MPO) for the region (who then allocates the funding to transit agencies) or to the transit operators directly, and the apportionment is based on urbanized population and density, as well as NTD performance metrics (49 CFR 5307).

1.2.4 Eligible Expenses & Reporting Requirements

The § 5311 & § 5307 funding formulas also differ based on permitted expenses and reporting requirements. Under the § 5311 formula, rural transit operators are permitted to use up to 100% of the FTA funding on operating expenses. Under the § 5307 formula, recipients are not permitted to use FTA funds for operating expenses *except* for under the stipulations set forth by the "100 bus rule". This rule, introduced under MAP-

21 legislation in 2010, states that if a § 5307 transit operator can finance operating expenses if the system:

- Operates 75 or fewer buses and the operating expenses do not exceed 75% of the total apportionment; OR
- Operates 76 to 100 buses and the operating expenses do not exceed 50% of the total apportionment (49 CFR 5307).

Total urban vehicle revenue miles are used to determine the portion of funding that can be used toward operating expenses.

Finally, the § 5307 and § 5311 funding formula programs require different levels of reporting to NTD. As of FY17, all transit systems, regardless of type of funding are required to report operational, service, and fleet information to NTD (49 CFR 5307). Reporting requirements are fewer for § 5311 recipients and are typically completed by the state DOT whereas § 5307 recipient typically self-report their data directly to NTD. This level of reporting likely requires extensive metrics tracking and a dedicated staff to compile and submit the data, which could be taxing on a rural transit system that is newly urbanized if staff resources are limited.

1.3 **Problem Statement**

The hypothesis for the thesis states that the 2020 decennial census will reflect trends of urbanization through an increased urbanized population and land area by state, as well as by county for those counties on the fringes of 2010 UAs. The extent of urbanization will depend upon how rapidly and far-reaching growth is occurring by state or region. The primary issue facing transit systems located in newly urbanized is a total

loss of funding through the § 5311 formula program, due to a deficiency determination by the FTA, which states "the state is deficient if it does not operate within or to/from a rural area" (FTA, 2018, § 5311-1). For transit systems located in areas that were rural in 2010, but are deemed to be urban after the 2020 Census, this clause could disqualify the service provider from receiving § 5311 funding.

If a system is loses § 5311 funding, it can theoretically just transition into § 5307 funding after it is urbanized. Although this sounds like a simple and feasible solution, there are several limitations to this solution:

1. The MPO could choose not to allocate any funding to the operator "because it had not yet generated any funds for the urban program.
2. If the MPO did allocate funding to the newly urbanized transit system, "the transit agency could not use any of its § 5307 funds for operating expenses. This is because the system has not yet generated any *urban* vehicle revenue miles, a determinate of the portion of funding allotted for operating expenses.
3. Additionally, it takes two years for NTD to certify and adjust funding after receiving reported urban vehicle revenue miles from the newly urbanized system (FTA 2015).

These rules and regulations leave transit systems located in newly urbanized areas in a tight spot, unable to return to § 5311 funding or initiate § 5307 funding. For this reason, we can classify rural to small or large urban transitions to be "high-risk", with the rural to large urban being more severe (Douthat, et. al 2018).

The main change for small urban systems transitioning to large urban is the shift in apportionment processes and reporting requirements. Small urban UAs have merged

with another UAs (if they share contiguous borders), but this changed in 2010 due to a Census "grandfathering" rule (Urban Area Criteria 2011). It is not confirmed yet if the Census will extend this rule to the 2020 Census. This rule is discussed at length in Chapter 3. The transition from small to large urban can be classified as a "medium-risk" transition. The UCs (rural areas per FTA's rules) that are predicted to undergo a high-risk transition after the 2020 Census are listed in Chapter 3 or in Appendix A (indicated by a highlighted cell). (Douthat, et. al 2018). At most 25 states (depending on the scenario) contain anywhere from 51 to 102 UCs that are at high-risk, which indicates that the aforementioned issues associated with this transition will be prevalent throughout transit systems in the US.

1.4 **Research Objectives**

This thesis seeks to answer the following questions:

1. What is the estimated percent change in urbanized and non-urbanized *population* and *land area* between 2010 and 2020 by state and by county?
2. How will a shift in the estimated 2020 urbanized and non-urbanized areas affect each state's funding for public transit through FTA's § 5311 and § 5307 formula programs?
3. Where in the US are these shifts in urbanization occurring?

Answering these questions will identify the geographic regions where urbanization is occurring, and quantify the predicted shift in urbanization by state and determine how many medium- and low-risk transitions may occur. These predictions can be used to estimate FTA § 5311 and § 5307 funding after the 2020 Census and to what extent the change in funding from 2010 will be. This, in turn, can help state Departments of

Transportation (DOTs) prepare for a potential decrease in rural transit funding. Further, states that will likely experience a decrease in FTA § 5311 funding can work to identify new sources of funding to cover any gaps. This will be crucial in continuing public transit service in newly urbanized areas. The objective of this research is to also clarify the rules of transitioning between FTA funding formulas, and expand upon the details of the transition that could have negative impacts for rural transit systems transitioning into urban systems.

1.5 **Technical Approach**

This research uses population and land area data from the 2000 and 2010 decennial censuses, and 2015 population and 2020 projected population data from the Environment Systems Research Institute (ESRI). These datasets were used to project block populations to 2020 using the shift-share method. The urbanization analysis was completed at the Census block geographic level (the smallest unit of Census geography) using logistic regression analysis following the model from Nord (2018) and Douthat et al. (2018). A logistic regression model was created for each state using a set of six different variables. The regression models predict a block's probability of being urban in 2020. Analyzing urbanization at the block level allows for aggregation to higher levels of Census geography (i.e. block group, tract, county, or state); the results from the analysis are reported at the county and state levels.

A total of six urbanization scenarios were created using the probability variable from the regression models to show different extents of urbanization, described in Chapter 2 and discussed at length in Chapter 3. The scenarios differ based on the probability variable and distance to an existing UA. The results of all six scenarios plus

scenarios for internal growth are included in either Chapter 3 or Appendix A. The results from these scenarios are the estimated § 5311 population and land area quotients by state, which can be used to estimate state apportionment after the 2020 Census.

1.6 **Key Findings**

The key findings from the urbanization scenarios indicate that at most, urbanized population by state can range from 6.9% (lower bound scenario; 75% probability of urbanizing and within 0 miles of an existing UA; see Section 2.4) to 11% (upper bound scenario, 50% probability of urbanizing and within ½ mile of an existing UA; see Section 2.4). For counties, urbanized population can increase by as much as 90% - 91.7% for the lower and upper bound scenarios, respectively. Under the lower bound scenario, urbanized land area is predicted to increase by at most 0.7% at the state level and 24.6% at the county level. Under the upper bound scenario, urbanized land area will increase at most 6.1% at the state level and 38.7% at the county level.

In addition to merger scenarios, populations for UCs and UAs were also calculated by looking at growth within the UC or UA (internal growth). Under internal growth, a total of 14 and 22 UCs are predicted to become small urban UAs under the 50% or greater urbanization scenario and the 75% or greater urbanization scenario. Additionally, additional 15/11 UCs have a population total within 5% of the UA 50,000 threshold under the lower/upper bound scenarios. These results of the upper and lower bound scenarios are presented and discussed at length in Chapters 3 and 4.

1.7 **Thesis Overview**

The subsequent chapters of the thesis expand upon the aforementioned sections: Chapter 2 discusses the data sources used and the methodology employed for manipulation and analysis of the data; Chapter 3 presents the results for the urbanization scenarios through tables and maps, and finally, the thesis concludes Chapter 4, a discussion of the results and directions for future research about the implications of urbanization on funding for rural public transit systems. Two appendices follow Chapter 4. For purposes of brevity, only two of the six urbanization scenarios are discussed at length within Chapters 3 & 4. However, Appendix A contains the results from the other four scenarios in table form.

CHAPTER 2. DATA & METHODOLOGY

An in-depth data analysis was required to identify urbanizing areas in the US and understand the impacts this urbanization in the context of FTA's § 5311 and § 5307 programs. A simplified overview of the methodology is illustrated in Figure 3. This analysis depicted all actual and forecasted population and land area data in 2010 geographic boundaries. The majority of the data cleaning and analysis was conducted in R Studio, and complemented by ESRI's ArcMap 10.5.1 and Microsoft Excel (R Core Team, 2018 & ESRI, 2017 & Excel 2016).

A lot of data cleaning was required for the analysis. First, 2000 Census block data were mapped to 2010 geographies using the NHGIS 2000-2010 crosswalk file (Mason et al. 2017). Then, 2000 and 2010 block level population data were projected using the shift-share projection method to obtain block population predictions for 2020. The projected populations were used in predicting 2020 urbanized and non-urbanized population totals. Next, a total of seven variables were created at the block level for the state regression models. These variables included 1) block population density; 2) distance to an existing UC or UA; 3) the classification of the closest urban area (if it was UC/non-urbanized or UA/urbanized); 4) distance to primary and secondary roads; 5) the total number of jobs in the block's respective Census tract; 6) the urban/rural classification for the block in the previous Census; and 7) growth rate of block's respective Metropolitan Statistical Area (MSA). See Douthat, Garrow, & Nord (2018) for the rational of these variables. After variables were prepared, they were input into regression models. Separate regression models were estimated for each individual state. Finally, a series of

urbanization scenarios were created based on different probability and distance criteria to identify areas that are expected to grow to be urban or merge with existing UA. Under each of these scenarios, the percent change (between 2010 and 2020) the percent change (since 2010) in urbanized and non-urbanized land area and population was calculated for all counties and states. These estimates were then used to calculate FTA § 5311 population and land area by state for 2020, and the states 2020 FTA § 5311 allocation quotient by state for 2020. The data sources, the manipulation of this data, and the programs and tools used to carry out this methodology are discussed in further detail in later sections.

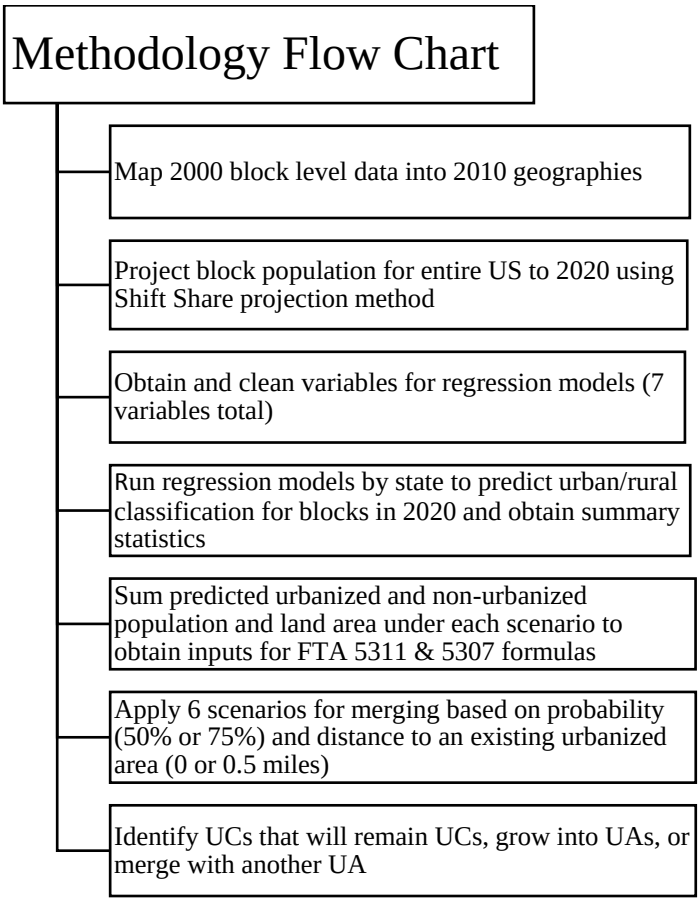


Figure 3 – Flow Chart Illustrating Overview of Methodology

In 2010, the US contained a total of 11,166,336 Census blocks, including Puerto Rico and the Island Areas (American Samoa, Guam, Commonwealth of the Northern Mariana Islands, and the US Virgin Islands). Because of data limitations, Puerto Rico and Island Areas blocks were excluded and assumed as constant, resulting in study area of 11,078,297 blocks without land area (water blocks) were also excluded from the dataset. These blocks (a total of 534,654) were filtered out if the value for land area was coded as '0' in the Census dataset. These blocks (a total of 534,654) were filtered out if the value for land area was coded as '0' in the Census dataset. The reduced the study area down to 10,543,643 blocks.

After obtaining initial regression results, Washington DC was deemed as non-representative for urbanization (it contains only urbanized blocks) and was also dropped from the dataset, resulting a total of 10,537,310 blocks. Finally, in creating the logistic regression model, it was discovered that 10,489 blocks were missing data for the "LSAD 2000" variable (which represents if a block is closest to a UC or UA, described in Section 2.3.1.3). These blocks were excluded from the 2010 regression models (resulting in a total of 10,526,821 blocks), but used for calculating 2020 projections. So, the 2010 regression models and 2020 projections were based on data for 10,526,821 and 10,537,310 Census blocks, respectively.

2.1 **2000 – 2010 Crosswalk**

In 2000, there were a total of 8,205,582 blocks in the US whereas in 2010, the US had a total of 11,078,297 blocks (values for both years exclude Puerto Rico and the Island Areas) (US Census Bureau 2001 & 2011). To understand 2000 block level population and land area data, it was necessary to map 2000 data into 2010 geographies using a cross-walk file from NHGIS (Mason et al. 2017). The 'stringr' package for R was used for sub-setting portions of the block geo-identifiers codes to obtain the geo-identifiers for higher levels of geography (Wickham, 2018).

The 2000-2010 block cross-walk file (Mason et al. 2017) provided the geo-identifier variable for blocks for both 2000 and 2010, and the weight of the 2000 blocks that laid in a 2010 block. That is, if a 2000 block was split between two 2010 blocks, there would be two records for the 2000 block. The weight for the first record of the 2000 block would be 95% and the second record for the block would have a weight of 5%. The same classification applied to the land area: the portion of the total 2000 land area that

fell in separate 2010 blocks was represented by a decimal number. The population weights and land area portions were applied to 2000 block populations and land areas, and then grouped by their respective 2010 Census block. In the same way, these newly calculated Census blocks were then grouped by their respective block group and summed to obtain the 2000 block group populations and land areas represented in 2010 geographies. Mapping 2000 block and block group data into 2010 geographies created accurate inputs for both the population projection and the creation of variables for the 2010 regression models

2.2 **2020 Population Projections – Shift-Share Method**

The shift-share projection method is a type of ratio time-series model that is used to project population (or employment) to a given year for a geographic area using a larger geographic reference area (Smith, Tayman, & Swanson, 2001). Equation 1 is the formula for the shift-share method, where *P* = population, i = smaller area (Census block), *j* = larger area (Census block group), *z* = number of years in the projection horizon, *y* = number of years in the base period, *b* = base year, *l* = launch year, and *t* = target year.

$$P_{it} = P_{jt}\left[\frac{P_{il}}{P_{jl}} + \left(\frac{z}{y}\right) * \left(\frac{P_{il}}{P_{jl}} - \frac{P_{ib}}{P_{jb}}\right)\right] \quad (1)$$

To obtain the 2020 projected block population, the Census block group populations for 2015 and 2020 were purchased from ESRI and used for the larger geographic reference area (ESRI 2015). Since block level population data is not available in between decennial census years, the data were first projected to 2015 using a base year

of 2000 and a launch year of 2010 (z = 5 years; y = 10 years). The output from the 2015 projection was then used to obtain a 2020 block level projection using a base year of 2010 and a launch year of 2015 (z = 5 years; y = 5 years).

One caveat of the shift-share projection method is that blocks with declining or slow growing population during the base period can result in a negative population projection (Smith et al., 2001). This indeed occurred within the block population dataset for this project. To correct for these blocks with negative population, the negative population was summed by the block group, and was then subtracted evenly from the blocks with population greater than '0'. This correction method was used for both iterations (2000 to 2015 & 2010 to 2020) of the population projection. The 2020 block population projections were used in calculating 2020 block densities for the 2020 state regression models, as well as in calculating the percent change in urbanized population by state and county (discussed further in Chapter 3).

2.3 **State Logistic Regression Models**

To predict whether a block would be urban or rural in 2020, a logistic regression models were used. The models were set up by state using the variables described below to predict if a block was urban or rural in 2010 (a known variable from Census 2010 data). Each of the state models was fitted to accurately predict the urban 2010 variable Accuracy for all models was 90% or greater (see Appendix B for model accuracies by state). After obtaining accuracy for each of the models, the urban 2020 variable was predicted using a combination of 2010 and forecasted 2020 variables. The 2020 prediction output yielded a probability variable at both 50% and 75%. These probabilities

were then used to create a set of urbanization scenarios, which are described in Section 2.4.

2.3.1 Regression Variables

A total of six different regression models were used, employing a combination of the six variables mentioned above (shown in Table 1). These variables were selected on the basis of how closely they related to Census criteria in classifying a block as either urban or rural (Douthat et al., 2018). Thirty-nine of the 50 states used all six variables, whereas the other 11 state models either excluded a variable and/or combined two or more density categories. Since the response variable of a logit regression must be binary, each of the variables was transformed to either a '0' or '1', where '0' represents 'false' and '1' represents 'true' (i.e., urban blocks were coded as '1' whereas rural blocks were coded '0'). The log of distance to primary and secondary roads and the log of employment were used in the regressions. Each of the regression variables and their transformations are described in more detail in the subsequent sub-sections

Table 1 – Regression Model Variables by State

State Abbreviation	Variables Included in Regression Model
AK	• Number of Jobs in Tract (LN) • Urban (UC or UA in 2000) • Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm • 2010 Pop. Density – 1000 - 4000+ psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban • Rural & Less than 4 Miles from Urban
AZ	• Number of Jobs in Tract (LN) • Urban (UC or UA in 2000)

	• Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm • 2010 Pop. Density – 1000 – 2000 psm • 2010 Pop. Density – 2000 – 4000 psm • 2010 Pop. Density – greater than 4000 psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban • Rural & Less than 4 Miles from Urban
NV	• Distance to Roads (LN) • Urban (UC or UA in 2000) • Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm • 2010 Pop. Density – 1000 – 2000 psm • 2010 Pop. Density – 2000 – 4000 psm • 2010 Pop. Density – greater than 4000 psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban • Rural & Less than 4 Miles from Urban
HI, ME, NH	• Number of Jobs in Tract (LN) • Distance to Roads (LN) • Urban (UC or UA in 2000) • Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm • 2010 Pop. Density – 1000 – 2000 psm • 2010 Pop. Density – 2000 – 4000 psm • 2010 Pop. Density – greater than 4000 psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban
MA, RI, IN, OK, VT	• Number of Jobs in Tract (LN) • Distance to Roads (LN) • Urban (UC or UA in 2000) • Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm • 2010 Pop. Density – 1000 – 4000 psm • 2010 Pop. Density – greater than 4000 psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban • Rural & Less than 4 Miles from Urban
AL, AR, CA, CO, CT, DE, FL, GA, ID, IL, IA, KS, KY, LA, MD, MI, MN, MS, MO, MT, NE, NJ, NM, NY, NC, ND, OH, OR, PA, SC, SD,	• Number of Jobs in Tract (LN) • Distance to Roads (LN) • Urban (UC or UA in 2000) • Closest Urban is a UA • 2010 Pop. Density – 500 – 1000 psm

TN, TX, UT, VA, WA, WV, WI, WY	• 2010 Pop. Density – 1000 – 2000 psm • 2010 Pop. Density – 2000 – 4000 psm • 2010 Pop. Density – greater than 4000 psm • Rural & Less than 1 Mile from Urban • Rural & Less than 2 Miles from Urban • Rural & Less than 4 Miles from Urban

Note: psm = persons per square mile

2.3.1.1 Census Block Densities

Block population density was included in the model because of its importance in Census rules in determining a block's urban/rural classification. Additionally, the Georgia urbanization model demonstrated that the strongest indicators of urbanization at the block level were block density and distance to an existing UA or UC (Nord 2018, Douthat et al., 2018). Block densities were calculated by dividing the population of the block by the block's total land area in square miles for both 2000 and 2010. This was completed through the used of several functions, like mutate, joins, group by, and summarize, within the 'dplyr' packages (Wickham, François, Henry, & Müler, 2018). These densities were then classified into the following groups:

- 500 to less than 1000 people/mi^2 (psm)
- 1000 to less than 2000 people/mi^2 (psm)
- 2000 to less than 4000 people/mi^2 (psm)
- Greater than or equal to 4000 people/mi^2 (psm)

These groups follow the aforementioned population density Census thresholds for urban blocks: a block is urban if it has a population density of 1,000 people per square mile or be located near an urban core and have a population density of 500 people per

square mile (Urban Area Criteria 2011). If a block fell into one of the categories, it was coded as '1' for its respective category and as '0' for the other categories (i.e., if a block had population density of 1500 psm, it was coded as '1' for the "2010 Pop. Density – 1000 – 2000 psm" variable and '0' for the other density variables.) All state regression models used these density categories with the exception of MA, RI, IN, OK, and VT, and AK, which combined density categories 1000-4000 people/mi^2 and categories 1000-greater than 4000, respectively (shown in Table 1).

2.3.1.2 Distance to an Existing UC or UA

Along with block density, a block's distance to an existing UC or UA was another strong indicator for urbanization in the Georgia model. The distances for each block to the closest UC or UA was executed using the Near Analysis tool in ESRI's ArcMap 10.5.1 (ESRI, 2017). Distance was calculated as the distance between the block's centroid to the border of the UA/UC, rather than to the center of the UA/UC. The distances (in miles) for each block were then classified into the following groups:

- Rural Block & less than 1 mile from a UA/UC
- Rural Block & less than 2 miles from a UA/UC
- Rural Block & less than 4 miles from a UA/UC

Urbanization is not always contiguous, and can be segmented by roads, commercial development, or other structures (Ratcliffe et al. 2016). To account for this fact, the Census has a rule to account for these "jumps" and "hops" in urbanized land area. Jumps refer areas spanning 2.5 miles along a road corridor, while hops refer to areas spanning no more than 0.5 miles. Under 2010 Census criteria, non-contiguous areas were

subject to these rules, allowing for multiple hops, but no hops after jumps (Urban Area Criteria 2011).

As with the density categories each block was assigned a ‘1’ in its respective distance category and ‘0’ for the other categories, making it binary for the regression input. Distances less than 3 and 4 miles were grouped because they are outside the distance of hops and jumps, but near enough to be vulnerable to conversion and urbanization. All states except for HI, ME, and NH used all three distance variables (see Table 1).

2.3.1.3 Closest to a UC or UA

In calculating the distance variables, the classification of the nearest area was also obtained with the use of the Near Analysis tool within ArcMap 10.5.1 (ESRI, 2017). This is another variable that is used in Census criteria for defining urban and rural classification at the block level. That is, whether the nearest area was classified as an UC in 2000 or an UA in 2000 (2010 for the 2020 prediction model). The numbers ‘75’ and ‘76’ represent UAs and UCs, respectively, under the Legal/Statistical Area Description (LSAD) Codes. Each UA and UC in the US is assigned a unique 5-digit Urban Area Census (UACE) Code, and are assigned an LSAD classification by the Census Bureau every decennial census.

If the nearest area was listed as a UA (or LSAD 75), the variable was coded as ‘1’, whereas blocks that were nearest to a UC (or LSAD 76) were coded as ‘0’. The assumption here is that if a block is closer to a UA rather than a UC, it is more likely to transition urban. The 2010 regression models used LSAD classifications from 2000, while the 2020 regression models used 2010 LSAD classifications. All of the state

regression models utilized the LSAD variable, represented in Table 1 by “Closest Urban is a UA”.

2.3.1.4 Distance to Primary & Secondary Roads

A block’s proximity to the nearest primary and secondary roads is not a Census criterion for determining urban/rural classification, but was used as another indicator of urbanization. The nearest distance to either a primary or secondary road was also calculated using the Near Analysis tool in ArcMap 10.5.1 (ESRI, 2017). The 2016 primary and secondary roads shapefile (local roads were not included) for the entire US was downloaded from the TIGER/Line Shapefiles database for the Census Bureau using the ‘tigris’ R package (Walker 2018). The data was then written to a shapfile using the ‘sf’ R package (Pebesma 2018). Data for 2016 were used rather than the 2015 roads dataset because there was no data in the 2015 file for Georgia. The assumption was made that the road network in 2020 will be similar that of in 2016. A maximum search distance of 10 miles was used in generating the near table in ArcMap. The output provided a value in miles for every block’s distance to either a primary or secondary road. The distances were then natural log transformed to create binary inputs for the regression models. These logged distances were used for both the 2010 and 2020 regression models.

2.3.1.5 Census Tract Jobs

Total employment at the tract level was used as a proxy for land cover (which reveals non-populated urbanized areas like airports or industrial parks) (Douthat et. al 2018). The land cover shapefile has not been updated since 2011, so it was not used in the analysis for potential lack of non-representativeness of the current land cover. Instead,

the employment variable was used to predict non-residential urbanization. In other words, employment data can reveal tracts that contain activity, but that may not have population within the blocks that comprise the tracts.

The employment data used for the regression models included the total number of jobs at the Census tract level, and was retrieved from the Census's LEHD Origin-Destination Employment Statistics (LODES) datasets for 2010 and 2015 using the 'lehdr' R package downloaded through the help of the 'devtools' package (Wickham et al. 2018 & Green 2017). Tracts are only included in the LODES dataset if the tract contains at least one job.

The 2010 and 2015 data were used to project total tract jobs to 2020. In 2010, a total of 72,527 tracts (99.3% of all US tracts) contained jobs compared to 2015, in which 72,585 tracts (99.4%) of all US tracts contained jobs (US Census Bureau 2015). The 2010 jobs data was available for all states except for Massachusetts, for which LODES data begins in 2011. Because of this, 2011 jobs data for Massachusetts was used in place of 2010. Similarly, 2015 jobs data was available for all states except for Wyoming, which LODES data is only available through 2013. To obtain an estimate of 2015 jobs for Wyoming, the state employment growth rate between 2010 and 2015 (5.4%) from the Bureau of Economic Analysis was applied to the total number of jobs in the tract (US BEA 2017).

To project employment data for each tract to 2020, the crude growth rate was first calculated. For the 58 tracts in the dataset that grew from containing zero jobs in 2010 to containing one or more jobs in 2015, a total of '1' was assigned to the 2010 tract in order to calculate the growth rate. Next, the 75th percentile for the growth rate was obtained as

0.379. For tracts with a growth rate within +/- 37.9%, a compound interest rate formula was applied to project jobs to 2020 (Equation 2). The formula is as follows:

$$A = P(1 + \frac{r}{n})^{t} \quad (2)$$

Where A = jobs by tract in 2020, P = total jobs by tract in 2010, r = calculated growth rate between 2010-2015, n = total times growth rate is compounded (1), t = number of years (1) (Stapel 2012). A value of '1' is used for n and t because the growth rate is already based on five-year period.

For tracts with growth rates outside of the 75th percentile, the compound interest rate formula was not applied, as the formula would yield an unrealistic projection for 2020 jobs for those tracts that had dramatic increases or decreases in jobs. Instead for these tracts, the total number jobs in 2015 was either doubled or halved depending upon if the growth rate was positive of negative, respectively. Finally, after obtaining a projection for total number of jobs in 2020 for all 72,585 tracts, the variable was log transformed. While the projected jobs variable was used in the 2020 state regression models, the 2010 regression model utilized the logged 2010 jobs dataset. For all states except for Nevada, the regression models indicated that the log of total jobs per tract was a strong indication for urbanization. As such, the logged jobs variable was included in all state regression models except for Nevada.

2.3.1.6 Urban/Rural Classification for Census Blocks

Census 2010 block population data included an urban/rural classification variable ('URBRURALA'), which indicated if a block was considered to be urban or rural. The

2000-2010 cross-walk file from NHGIS was used to determine if a 2000 block was urban or rural in 2010 geography (Mason et al. 2017). In completing the cross-walk, two new population variables were created to yield the total urban and total rural population within a block. Logic statements were used to classify the block as either urban or rural: 1) if the total urban population within the block exceed the total rural population, then the block was coded as urban in 2000; 2) if the total rural population within the block exceed the total urban population, then the block was coded as rural in 2000; 3) if there was a '0' population value for both the urban and rural variables, the distance variable was used to provide a urban or rural classification. If the distance of the block to an existing UA or UC was 0 miles, then the block was coded as urban. If the distance was greater than 0, then the block was coded as rural.

2.3.1.7 Metropolitan Statistical Area (MSA) Growth

The Georgia urbanization model included the Atlanta and Savannah MSAs, which house the state's fastest growing counties (Douthat et al., 2018). This, in turn, improved the model's explanatory power for urbanization for the blocks with the MSAs. MSA growth rates were initially calculated and included in the 2010 regression models. The crude growth rate for each MSA in the US was calculated by taking the average growth rates of the counties comprised by the MSA (not all counties are housed within an MSA) (US BEA 2017). Two variables were created from the mean and the 75th percentile of the MSA growth rate. For MSAs that had growth rates greater than or equal to the mean MSA growth rate (11.5%), then it was coded as '1'. The same rule was applied in creating the 75th percentile MSA growth rate (16.7%) variable. The output from the 2010 regression models indicated that MSA growth rate was not a strong explanatory variable

for urbanization, and, therefore, were not included in the either the 2010 or 2020 regression models.

2.3.2 Regression Models by State

After the regression variables were tailored to each state model to obtain monotonicity throughout variable coefficients, the models were run by state in R Studio using the 'glm' and 'predict' functions included in the 'stats' package (R Core Team 2018). To evaluate the accuracy of each state's regression models, several statistics were generated and are included in Appendix B. For each 2010 state regression model, the statistical outputs include:

1. The results from each regression model (coefficients, probabilities, standard errors, z-values and confidence intervals by variable). The 'jtools' package was used to produce the model summary statistics (Long 2018). The probabilities within the regression model results can be read as "holding all other variables constant, if the block was [insert variable name], then it is [insert probability] more likely to be urban.
2. The model fit, including the pseudo R-squared value. The R^2 value can be interpreted as explaining the amount of variation in the data explained by the value. A pseudo R-squared, on the other hand, still indicates the prediction value of a regression model, but the value is relative to other models that are predicting the same variable using the same variables (UCLA 2011).
3. The accuracy of the model and the confusion matrix, which was produced using the 'caret' package in R (Kuhn et al 2018). The confusion matrix shows the total true positives and negatives, as well as the false positives and negatives in the

predicted dataset, which indicates how well the model is predicting the urban/rural variable.

4. A plot of each model's Receiver Operating Characteristics (ROC) Curve using the 'pROC' R package (Robin et al 2011). An ROC curve depicts the true positive rate (sensitivity) against the false positive rate (1 – specificity) of the model in a plot (Tape n.d.). All ROC curves were produced using the 'pROC' package.

After the 2010 regression models were run and it was confirmed that the models were accurately predicting urbanization for 2010, the 2020 datasets by state were input into the regression models to produce a probability variable for each block. The probability value assigned to the block indicates how likely the block is to be urban in 2020. These values were used to create urbanization scenarios, which are described in Section 2.4.

2.4 **Urbanization Scenarios**

A total of six urbanization scenarios were created using the probability variables from the regression output and distances to surrounding UAs and UCs generated by the near analysis completed in ArcMap. The criteria for each scenario is described below:

Merge **IF**:

1. The probability of the block being urban in 2020 is 50% or greater **AND**
    A. Is classified as UC in 2010 **AND** within ½ mile of a 2010 UC or UA (Scenario 1A); **OR**
    B. Is classified as UC in 2010 **AND** within 0 miles (contiguous) of a 2010 UC or UA (Scenario 1B); **OR**

C. Is classified as UA in 2010 **AND** within 0 miles (contiguous) of another 2010 UA (Scenario 1C).

2. The probability of the block being urban in 2020 is 75% or greater **AND**

   A. Is classified as a UC in 2010 **AND** is within ½ mile of a 2010 UC or UA (Scenario 2A); **OR**

   B. Is classified as a UC in 2010 **AND** is within 0 miles (contiguous) of a 2010 UC or UA (Scenario 2B); **OR**

   C. Is classified as a UA in 2010 **AND** is within 0 miles (contiguous) of another 2010 UA (Scenario 2C).

Scenarios 1C and 2C are predicated on UA merger rules under which Census does not currently operate (Urban Area Criteria 2011). These scenarios are proposed to show the change in urbanized population and land area if two existing UAs were to merge to become a single UA. Such a rule could create "mega-UAs" that stretch across state borders. UAs were allowed to merge under Census rules up until 2000, after which existing UAs were "grandfathered" into the 2010 Census (this will be discussed at length in Chapter 3) (Urban Area Criteria 2011). This change in rule created regions of fragmented UAs and others with very large UAs (FTA 2015). Although large agglomerations of continuous urbanization are would be challenging to address from a funding and programming standpoint, some urbanization analysts advocate for these large agglomerations to be maintained for purposes of data analysis.

The merging of UCs into UAs is just one way in which urbanization can occur. Urbanization can also occur through internal population growth of a UA/UC, as well as through the annexation of blocks adjacent to a UA/UC, resulting in an increase in

urbanized population *and* land area. These urbanization methods are described further in Chapter 3.

2.4.1 Identifying the Nearest UA or UC

The 2020 regression outputs were aggregated by their respective Census division (West, South, Midwest, and Northeast) and brought into ArcMap to conduct another Near Analysis, this time to obtain the distances between the UCs and UAs (these are the distances used to create each of the scenarios described above). The first step in the near analysis was to dissolve by the nearest UC/UA to assign blocks predicted to be urban to their closest UA or UC. Then, isolated slivers of a UC/UA were removed to prevent false merging. This could occur if an isolated portion of a UC/UA were contiguous to another UC/UA but the remained of the UC/UA to which the isolate belongs may not be contiguous. These isolates were removed by selecting for shape areas greater than ½ square mile. The maximum number of closest matches was set to 3, which yielded the three closest UCs/UAs to the input UC/UA, ranking each by its proximity. The output from this analysis was then brought back into R to generate the scenarios.

2.4.2 Selecting Mergers & Calculating New Urbanized and Non-Urbanized Population & Land Area Quotients

In 2010, there were a total of 3,573 UCs and UAs in the US (excluding Puerto Rico and the Island Areas). Each of the scenarios yielded a fewer number of UCs and UAs, meaning UCs/UAs had been absorbed by other UCs/UAs. Using the distances generated from the near analysis described above, each of the six merger scenarios (1A-2C) was created (see 2.4). For example, under Scenario 1A (50% & within ½ mile), the

Arlington, TN UC is predicted to merge with the Memphis, TN—MS—AR UA. There were some instances in which a UC/UA was contiguous (within 0 miles) to more than one UC/UA. In this situation the input UC/UA was assigned to merge with the contiguous UC/UA that had the highest population. The new population and land area for each UC/UA was summed and assigned as "Non-Urbanized" if population was less than 50,000, "Small Urban" if population was between 50,000 and 200,000, and "Large Urban" if population was greater than 200,000. Those areas assigned as "Small Urban" or "Large Urban" was then classified as "UA" in each scenario.

These scenario population and land area sums and classifications were joined back to the original 2020 block file containing population and land area. Then, each the projected population and land area was summed at both the state and county levels for each scenario. This yielded a new urbanized population and land area for each of the scenarios. The percentages of urbanized and non-urbanized population and land area under each scenario were then compared to the 2010 percentages of urbanized and non-urbanized population and land area at both the county and state levels. The tables and maps containing the percent changes for population and land area are included in Chapter 3 or Appendix A.

The population and land area predictions were also used in calculating each state's relative share of the national non-urbanized population and land area. These shares are used as inputs for the FTA § 5311 formula, with the national share of non-urbanized population having a weight of 80% and non-urbanized land area with a weight 20%. Each state's weighted non-urbanized population and land area was calculated and added to obtain a predicted quotient, representing the state's share of the total § 5311

apportionment. These quotients were compared to the 2010 § 5311 quotients (calculated using the same criteria and method), to obtain the percent change in each state's overall share of rural transit funding. These values are represented in maps and tables within the Results chapter, and can be used to calculate predicted apportionment after the 2020 Census.

CHAPTER 3. RESULTS

The results from Scenarios 1A (50% probability for urbanization and with ½ mile of an existing UA) and 2B (75% probability for urbanization and within 0 miles of an existing UA) described in Chapter 2 are included in the following section; these scenarios represent the upper and lower bounds of the merger scenarios where only UCs are candidates for merging. The scenarios are presented through the use of both tables and maps. County maps are included to give an understanding of where urbanization is occurring geographically within the state. The results from the remaining scenarios from Chapter 2 are included in Appendix A. Additionally, this section includes the results of UCs that are predicted to grow to UAs through internal population growth. For this analysis, Puerto Rico, and the Island Areas § 5311 apportionment percentages are held constant. This is because collectively these islands account for 0.63% of the US non-urbanized population and 0.06% of the nation's non-urbanized land area, thus, having little effect on the 5311 quotients for other states.

3.1 Types of Urbanization and Census Rules

An area can become urbanized through one of three ways: 1) increased population in blocks that are already urban; 2) merging of blocks that are adjacent to the existing UA; and 3) merging of entire UCs that are adjacent to the existing UA. UCs are eligible candidates for merging into either another UC or into a UA, while UAs are not (Urban Area Criteria 2011). If two UCs merge and their combined population is greater than 50,000, then the new agglomeration will be classified as a UA. Small Urban UAs (populations of 50,000 to 199,999) are candidates for transitioning into Large Urban UAs

(populations 200,000 or greater). In the 2000 Census, UAs could merge, but for the 2010 Census, Congress changed this rule and UAs were not eligible to merger into another UA. Areas that were classified as a UA in 2000 were "grandfathered" in as standalone UAs for the 2010 Census (Urban Area Criteria 2011). As a result, there were no UA mergers between 2000 and 2010, which fulfilled the purpose of the rule: to prevent a significant number of splits (occur if a UA loses population) or mergers (FTA 2015). Under this rule, a merger between two UAs would only occur if one UA lost population to less than 50,000 (which would classify it as a UC) and still shared contiguous borders with a UA. In other words, even if a Small Urban UA grew in land area to share contiguous border with another UA, the two areas would not merge. This scenario did not occur between 2000 and 2010. It has not yet been decided if this rule will be modified for the 2020 Census (M.R. Ratcliffe, personal communications, July 3, 2018).

3.1.1 Interpreting the State Regression Models

The accuracy of the 50 state regression models used to predict urbanization ranged from 90.3% (Delaware) to 98.6% (North Dakota). The general results from these models indicate that the three strongest predictors of a block being urban in 2010 were 1) the block's Urban/Rural classification in the previous Census; 2) the block's population density; and 3) the distance to an existing UC or UA. These variables and their probabilities can be interpreted as follows:

1. Holding all other variables constant, if the block was classified as urban in the previous Census, it was 99% more likely to be urban in 2020.

2. Holding all other variables constant, if the block's population density was between 500 and more than 4,000 psm, then it was 88.2% to 94.4% more likely to be urban in 2020.
3. Holding all other variables constant, if the block was classified as Rural in the previous Census and was less than 1 to 4 miles from an existing UC or UA, then it was 87.8% to 97.9% more likely to be urban in 2020.

3.2 **Setting the 2010 § 5311 Quotient Baseline**

The apportionment quotient for the states in 2010 is pictured below in Figure 4. The quotient represents each state's unconstrained share of the appropriated funds through the § 5311 formula. This quotient was calculated by dividing each state's national share of non-urbanized land area and population over the total non-urbanized land area and population for the US in 2010. Each state's land area portion was multiplied by 20% and the population portion was multiplied by 80%. These two percentages are used to determine the state's total apportionment. No state is eligible to receive more than a 5% share of their portion of non-urbanized land area (i.e., Alaska and Texas). This was not corrected for in the percentages reported below, therefore, they are unconstrained, but this only affects 1.98% of funding nationally, from one state Texas, in 2010.

As depicted in Figure 4, those states that are eligible to receive the highest share of § 5311 funding include Texas, California, North Carolina, Alaska, and Ohio. It could be expected that vastly rural western states, such as Montana, Wyoming, Nevada, etc., would receive a higher quotient of § 5311 funding, but this is not so because these state's shares of non-urbanized population are low relative to other states. Since the highest

weighted input into the funding formula is non-urbanized population, these states do not receive a large portion of § 5311 funding. The maps provided in the next section show percent change in the § 5311 population and land area quotient relative to the numbers presented in this 2010 map.

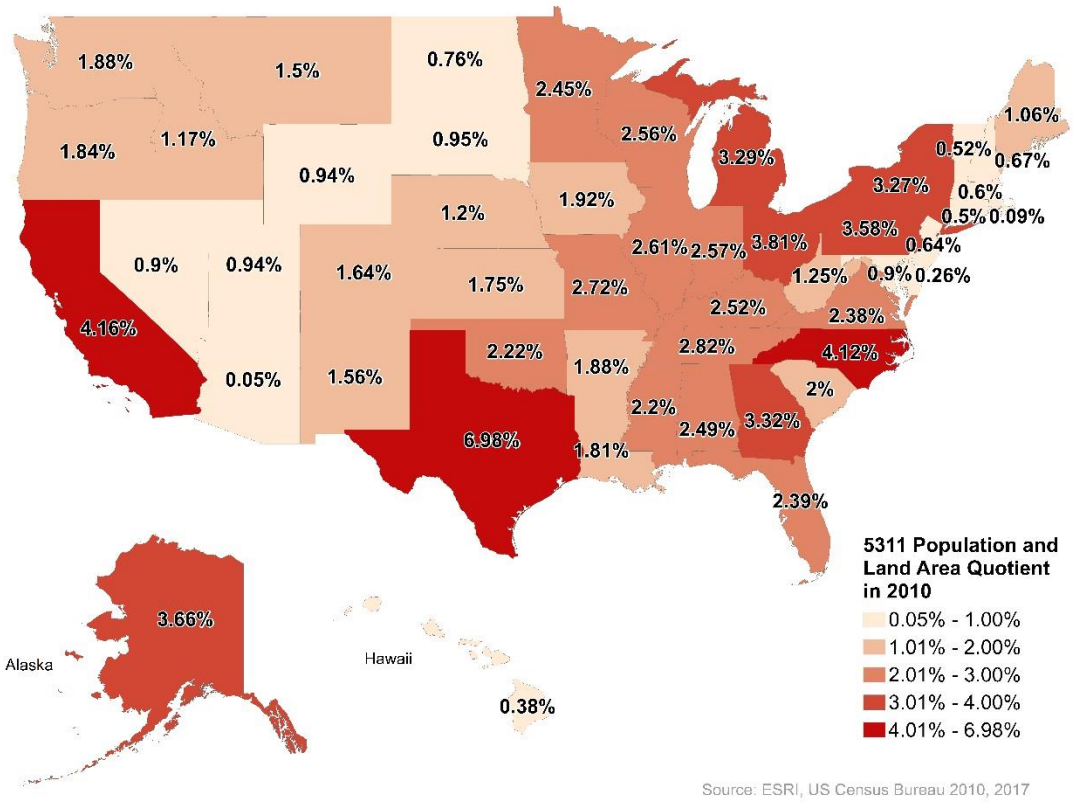


Figure 4 – FTA § 5311 Apportionment Quotient for 2010 by State. Sources: ESRI, FTA 5311, Census Bureau 2010.

3.3 The Urbanization Scenarios

Although the topic of this thesis is on the *urbanization* of rural areas in the US, the results are presented in the context on *non-urbanized* land area and population. This is to show the non-urbanized land area and population deficits throughout the country to understand which states or regions areas are likely to be subjected to the aforementioned

issues with urbanization and FTA § 5311 funding, because of urbanization. Those states with negative percent differences in apportionment will be presented with a funding gap. Maps and tables are used to illustrate the urbanization and § 5311 funding trends for the merger scenarios. The internal growth scenarios are shown in tables.

3.3.1 Scenario 1A: 50% probability & Within ½ Mile

Scenario 1A allows for the merging of an UC with either another UC or an UA if the blocks within UC have at least a 50% probability of being classified as urban after the 2020 Census and the UC is located within ½ mile of an existing UC/UA. This scenario is the upper boundary (excluding UA merger scenarios) estimate for urbanization (showing the maximum predicted urbanization) under the current Census urbanization rules.

Selecting for blocks with a 50% probability of urbanizing and assuming a merge if the UC is within ½ mile of the UA, the total number of UCs/UAs was reduced to 3,427 from 3,573. A total of 102 UCs are predicted to undergo a "high-risk" transition from UC to a Large Urban UA (see Table 2/Appendix A). A total of 49 UCs are predicted to merge into another UC, and a total of 44 UCs are predicted to merge into a Small Urban UA. The list of "high-risk" mergers is included in Table 2. A full list of all mergers under this scenario is included in Appendix A.

Table 2 – List of Urban Clusters Predicted to Undergo a "High-Risk" Merge under Scenario 1A (US Census Bureau 2010).

State	2010 Urban Cluster	Name of UA Predicted to Merge Into	UC/UA LSAD
Alabama	Athens, AL	Huntsville, AL	UA
	Grand Bay, AL	Mobile, AL	UA
	Hazel Green, AL	Huntsville, AL	UA

Arizona	Buckeye, AZ	Avondale--Goodyear, AZ	UA
	Marana West, AZ	Tucson, AZ	UA
	Vail, AZ	Tucson, AZ	UA
	Vistancia, AZ	Phoenix--Mesa, AZ	UA
California	Auburn--North Auburn, CA	Sacramento, CA	UA
	Forestville, CA	Santa Rosa, CA	UA
	Half Moon Bay, CA	San Francisco--Oakland, CA	UA
	Mecca, CA	Indio--Cathedral City, CA	UA
Colorado	Lochbuie, CO	Denver--Aurora, CO	UA
Connecticut	Jewett City, CT	Worcester, MA--CT	UA
	Willimantic, CT	Hartford, CT	UA
Delaware	Middletown, DE	Philadelphia, PA--NJ--DE--MD	UA
Florida	Crooked Lake Park, FL	Winter Haven, FL	UA
	Four Corners, FL	Orlando, FL	UA
	Golden Gate Estates, FL	Bonita Springs, FL	UA
	Jupiter Farms, FL	Miami, FL	UA
	Poinciana, FL	Kissimmee, FL	UA
	Santa Rosa Beach, FL	Fort Walton Beach--Navarre--Wright, FL	UA
	Wedgefield, FL	Orlando, FL	UA
Georgia	Buckhead (Bryan County), GA	Savannah, GA	UA
	Monroe, GA	Atlanta, GA	UA
	Winder, GA	Atlanta, GA	UA
Hawaii	Haleiwa--Waialua--Pupukea, HI	Urban Honolulu, HI	UA
Illinois	Lake Holiday, IL	Chicago, IL--IN	UA
	Wonder Lake, IL	Round Lake Beach--McHenry--Grayslake, IL--WI	UA
Indiana	Lowell, IN	Chicago, IL--IN	UA
Louisiana	Donaldsonville, LA	Baton Rouge, LA	UA
	Gramercy--Lutcher, LA	New Orleans, LA	UA
	Rayne, LA	Lafayette, LA	UA
Massach-usetts	North Brookfield, MA	Worcester, MA--CT	UA

Maryland	Glenwood, MD	Baltimore, MD	UA
	Manchester, MD	Baltimore, MD	UA
	Romancoke, MD	Baltimore, MD	UA
Michigan	Cedar Springs, MI	Grand Rapids, MI	UA
	Goodrich, MI	Detroit, MI	UA
	Paw Paw, MI	Kalamazoo, MI	UA
	Sparta, MI	Grand Rapids, MI	UA
Minnesota	Monticello--Big Lake, MN	Minneapolis--St. Paul, MN--WI	UA
Missouri	Eureka, MO	St. Louis, MO--IL	UA
	Platte City, MO	Kansas City, MO--KS	UA
	Smithville North, MO	Kansas City, MO--KS	UA
	Willard, MO	Springfield, MO	UA
Mississippi	Canton, MS	Jackson, MS	UA
North Carolina	Archer Lodge--Clayton, NC	Raleigh, NC	UA
	Fearrington Village, NC	Durham, NC	UA
	Lake Norman of Catawba, NC	Charlotte, NC--SC	UA
	Maiden, NC	Hickory, NC	UA
	Smithfield, NC	Raleigh, NC	UA
	Wendell--Zebulon, NC	Raleigh, NC	UA
Nebraska	Plattsmouth, NE	Omaha, NE--IA	UA
New Hampshire	Epping, NH	Boston, MA--NH--RI	UA
New Jersey	Newton, NJ	New York--Newark, NY--NJ--CT	UA
New York	Bedford, NY	New York--Newark, NY--NJ--CT	UA
	Chester, NY	Poughkeepsie--Newburgh, NY--NJ	UA
	Lockport, NY	Buffalo, NY	UA
	Ravena, NY	Albany--Schenectady, NY	UA
	Walden, NY	Poughkeepsie--Newburgh, NY--NJ	UA
Ohio	Genoa, OH	Toledo, OH--MI	UA
Oklahoma	Claremore, OK	Tulsa, OK	UA
	Collinsville, OK	Tulsa, OK	UA

	Harrah, OK	Oklahoma City, OK	UA
Oregon	Aumsville, OR	Salem, OR	UA
Pennsyl-vania	Burgettstown, PA	Pittsburgh, PA	UA
	Quarryville, PA	Lancaster, PA	UA
South Carolina	Camden, SC	Columbia, SC	UA
	Chesnee, SC	Spartanburg, SC	UA
	Lake Murray North Shore, SC	Columbia, SC	UA
	Seneca, SC	Greenville, SC	UA
Tennessee	Arlington, TN	Memphis, TN--MS--AR	UA
	Atoka, TN	Memphis, TN--MS--AR	UA
	Norris, TN	Knoxville, TN	UA
Texas	Alvarado, TX	Dallas--Fort Worth--Arlington, TX	UA
	Anna, TX	McKinney, TX	UA
	Boerne, TX	San Antonio, TX	UA
	Cleburne, TX	Dallas--Fort Worth--Arlington, TX	UA
	Cleveland, TX	Houston, TX	UA
	Deerwood, TX	Conroe--The Woodlands, TX	UA
	Denton Southwest, TX	Denton--Lewisville, TX	UA
	Forney, TX	Dallas--Fort Worth--Arlington, TX	UA
	Grangerland, TX	Houston, TX	UA
	Homesteads Addition, TX	Dallas--Fort Worth--Arlington, TX	UA
	Justin, TX	Dallas--Fort Worth--Arlington, TX	UA
	Lake Conroe Eastshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Northshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Westshore, TX	Conroe--The Woodlands, TX	UA
	Magnolia, TX	Houston, TX	UA
	Manor, TX	Austin, TX	UA
	Odem, TX	Corpus Christi, TX	UA

	Paloma Creek South--Paloma Creek, TX	Dallas--Fort Worth--Arlington, TX	UA
	Pecan Acres, TX	Dallas--Fort Worth--Arlington, TX	UA
	Seguin, TX	San Antonio, TX	UA
	Springtown, TX	Dallas--Fort Worth--Arlington, TX	UA
Utah	Santaquin, UT	Provo--Orem, UT	UA
Virginia	Purcellville, VA	Washington, DC--VA--MD	UA
	Indianola, WA	Bremerton, WA	UA
	Snoqualmie, WA	Seattle, WA	UA
Wisconsin	Burlington, WI	Milwaukee, WI	UA
	Mukwonago, WI	Milwaukee, WI	UA
	Hudson, WI--MN	Minneapolis--St. Paul, MN--WI	UA

3.3.1.1 Non-Urbanized Population Under Scenario 1A

Under these scenarios and using the ESRI population data, the national total non-urbanized population is predicted to decrease by 1,695,956 people, which would represent a 1.9% overall reduction in non-urbanized population between 2010 and 2020 for Scenario 1A (see Figure 5). For the remaining urbanization/merger scenarios, the national change in non-urbanized population is:

- Scenario 1B (50% probability & within 0 miles): An ***increase*** of 0.65% (or 573,835);
- Scenario 2A (75% probability & within ½ mile): An ***increase*** of 2.73% (or 2,428,140 persons);
- Scenario 2B (presented in Section 3.3.2; 75% probability & within 0 miles): An ***increase*** of 3.18% (or 2,832,743 persons).

So, the national percent change between the urbanization scenarios (excluding the UA merger scenarios), non-urbanized population is predicted to change between -1.91% and 3.18%.

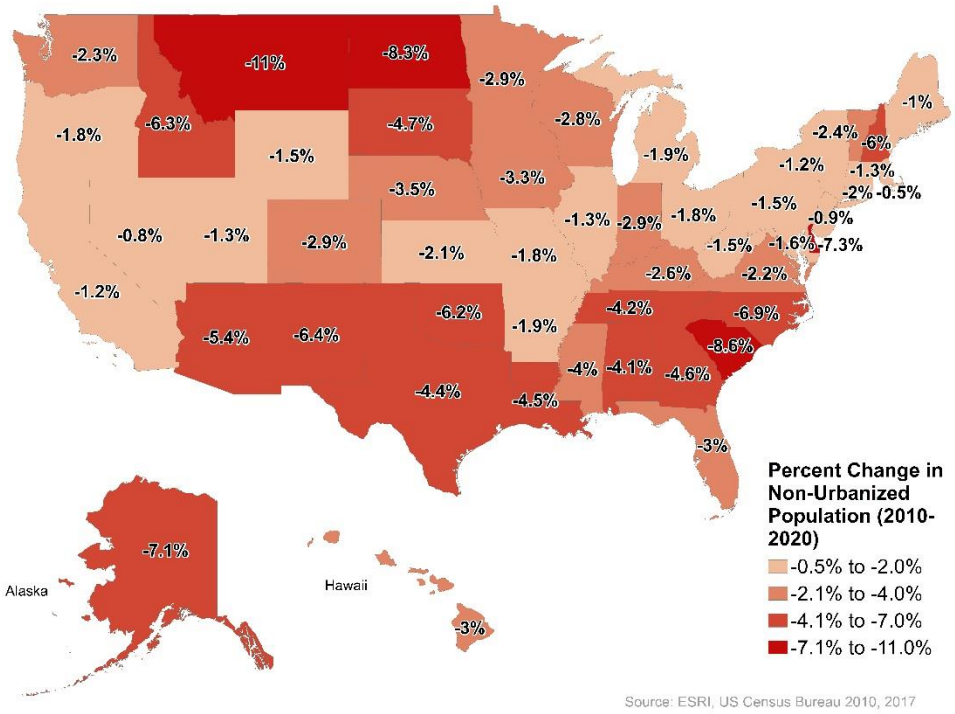


Figure 5 – Percent Change in Non-Urbanized Population under Scenario 1A by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

Urbanization is also modeled at the county level in Figure 6 to show which counties within each state may be the drive behind the state's overall change. The counties outlined in blue, 50 counties in total, indicate that the county grew from less than to greater than 50% urbanized population between 2010 and 2020. A full list of these counties is included in Table 3. Further, under Scenario 1A, a total of 41 counties are predicted to become principally urban, with a total urbanized population surpassing

the 89% threshold set forth by the Census Bureau (US Census Bureau 2016). Per Census rules, these counties in particular are of concern as they are predicted to become principally urban after the 2020 Census (US Census Bureau 2016). In Figure 6, these counties are represented by a yellow crosshatch.

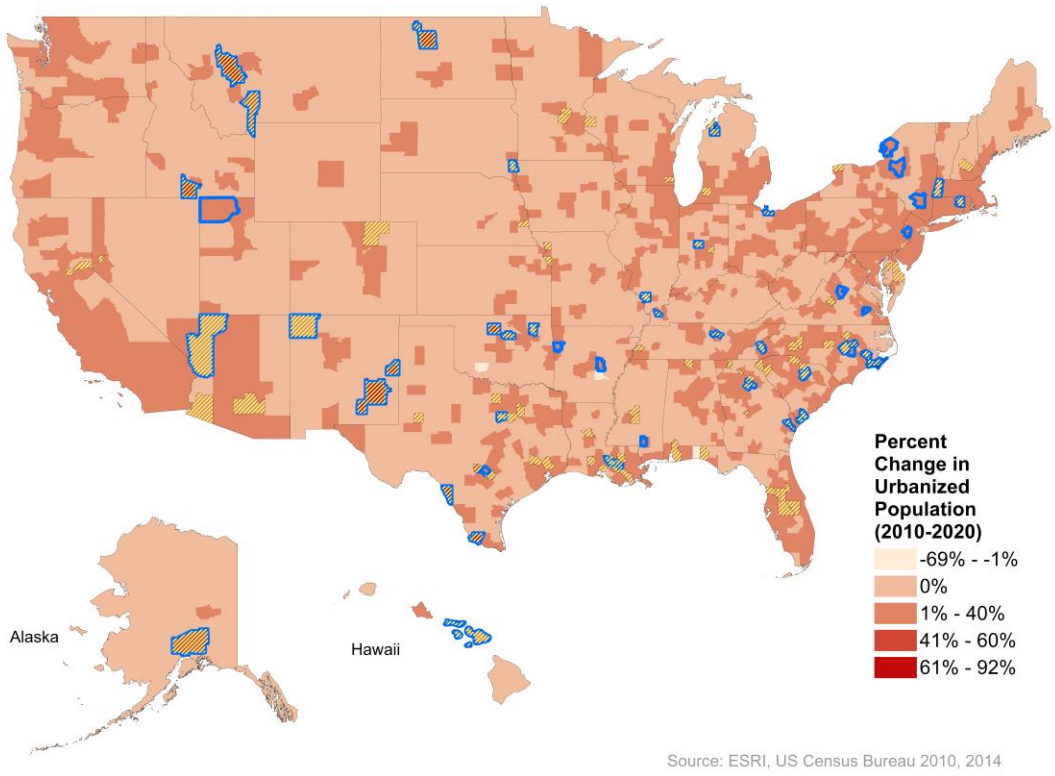


Figure 6 – Percent Change in Urbanized Population under Scenario 1A by County between 2010 and 2020; Counties Predicted to Grow to More Than 50% Urbanized Population (Blue); Counties Predicted to Increase more than 10% in Urbanized Population (Yellow Crosshatch). Sources: ESRI, US Census Bureau 2010 & 2014.

Table 3 – List of Counties that Grew to over 50% Urbanized Population under Scenario 1A (US Census Bureau 2010).

County Name	State	2010 % Urbanized Population	2020 % Urbanized Population	% Change in Urbanized Population (2010-2020)	% Change in Urbanized Land Area (2010-2020)
Matanuska-Susitna Borough	AK	0.0%	55.9%	55.9%	0.4%
Crawford	AR	48.0%	52.0%	3.9%	0.6%
Lonoke	AR	45.2%	51.0%	5.8%	0.3%
Mohave	AZ	26.7%	52.5%	25.8%	0.4%
Windham	CT	27.8%	53.8%	26.0%	3.8%
Barrow	GA	16.7%	82.8%	66.1%	38.7%
Oconee	GA	49.7%	65.1%	15.5%	12.8%
Walton	GA	33.4%	63.1%	29.8%	9.4%
Bryan	GA	30.6%	55.9%	25.4%	3.6%
Maui	HI	36.1%	53.2%	17.1%	4.0%
Twin Falls	ID	0.0%	65.1%	65.1%	1.0%
Jackson	IL	46.8%	65.7%	18.9%	3.7%
Boone	IN	38.4%	51.6%	13.2%	4.2%
McCracken	KY	0.0%	73.8%	73.8%	18.1%
St. James Parish	LA	0.0%	61.6%	61.6%	7.2%
Iberville Parish	LA	34.4%	52.2%	17.8%	1.9%
Berkshire	MA	45.1%	59.2%	14.1%	1.1%
Grand Traverse	MI	0.0%	52.5%	52.5%	9.1%
Lamar	MS	49.6%	57.3%	7.6%	2.6%
Gallatin	MT	0.0%	50.0%	50.0%	0.8%
Lewis and Clark	MT	0.0%	73.3%	73.3%	0.8%
Wayne	NC	49.8%	59.2%	9.4%	6.1%
Johnston	NC	22.2%	55.1%	32.9%	8.8%
Craven	NC	48.8%	73.2%	24.4%	4.6%
Carteret	NC	0.0%	68.8%	68.8%	9.3%
Haywood	NC	44.6%	56.0%	11.4%	3.8%
Wilson	NC	0.8%	63.9%	63.1%	7.2%
Ward	ND	0.0%	71.1%	71.1%	1.4%
Hunterdon	NJ	45.6%	50.3%	4.8%	1.3%

Curry	NM	0.0%	86.2%	86.2%	1.6%
San Juan	NM	40.8%	55.3%	14.5%	0.4%
Chaves	NM	0.0%	75.5%	75.5%	0.5%
Ulster	NY	48.8%	51.4%	2.6%	0.5%
Oneida	NY	49.4%	50.1%	0.7%	0.0%
Jefferson	NY	49.8%	50.5%	0.8%	0.0%
Erie	OH	8.4%	71.7%	63.3%	12.1%
Rogers	OK	20.6%	54.5%	33.9%	5.8%
Payne	OK	0.0%	59.9%	59.9%	3.1%
Garfield	OK	0.0%	78.3%	78.3%	2.4%
Beaufort	SC	42.5%	81.8%	39.3%	10.5%
Kershaw	SC	20.4%	53.1%	32.7%	4.5%
Lincoln	SD	49.5%	62.6%	13.1%	2.3%
Putnam	TN	0.0%	64.5%	64.5%	11.6%
Comal	TX	49.0%	57.2%	8.2%	9.3%
Johnson	TX	29.4%	68.9%	39.5%	10.4%
Starr	TX	0.0%	80.6%	80.6%	2.3%
Maverick	TX	0.0%	91.7%	91.7%	1.6%
Box Elder	UT	49.1%	52.2%	3.1%	0.4%
Prince George	VA	46.6%	56.4%	9.8%	5.0%
Albemarle	VA	49.4%	52.2%	2.8%	2.1%

3.3.1.2 Non-Urbanized Land Area Under Scenario 1A

Additionally, non-urbanized land area was reduced by 7.13% nationally. The percent change by state is illustrated in Figure 7, with Florida, North Carolina, and South Carolina having the largest reduction in non-urbanized area. As with non-urbanized population, urbanized land area was also mapped at the level to identify specific counties that are predicted to experience the largest deficit in non-urbanized land area (see Figure 8). For the aforementioned states, several counties within the state fall within the 1-10% and 11-20% categories for percent increase in urbanized land area. For the remaining urbanization/merger scenarios, the national change in non-urbanized land area is:

- Scenario 1B (50% probability & within 0 miles): A ***decrease*** of 7.05% (or 242,864 square miles);
- Scenario 2A (75% probability & within ½ mile): A ***decrease*** of 6.52% (or 224,638 square miles);
- Scenario 2B (presented in section 3.3.2; 75% probability & within 0 miles): A ***decrease*** of 6.55% (or 225,960 square miles).

Between the four scenarios (excluding the UA merger scenarios), the national percent change in non-urbanized land area is predicted to be between -6.52% and -7.13%. Considering these predictions in conjunction with the non-urbanized population changes presented in Section 3.3.1.1, an increase in urbanized land area does not always coincide with an increase in urbanized population.

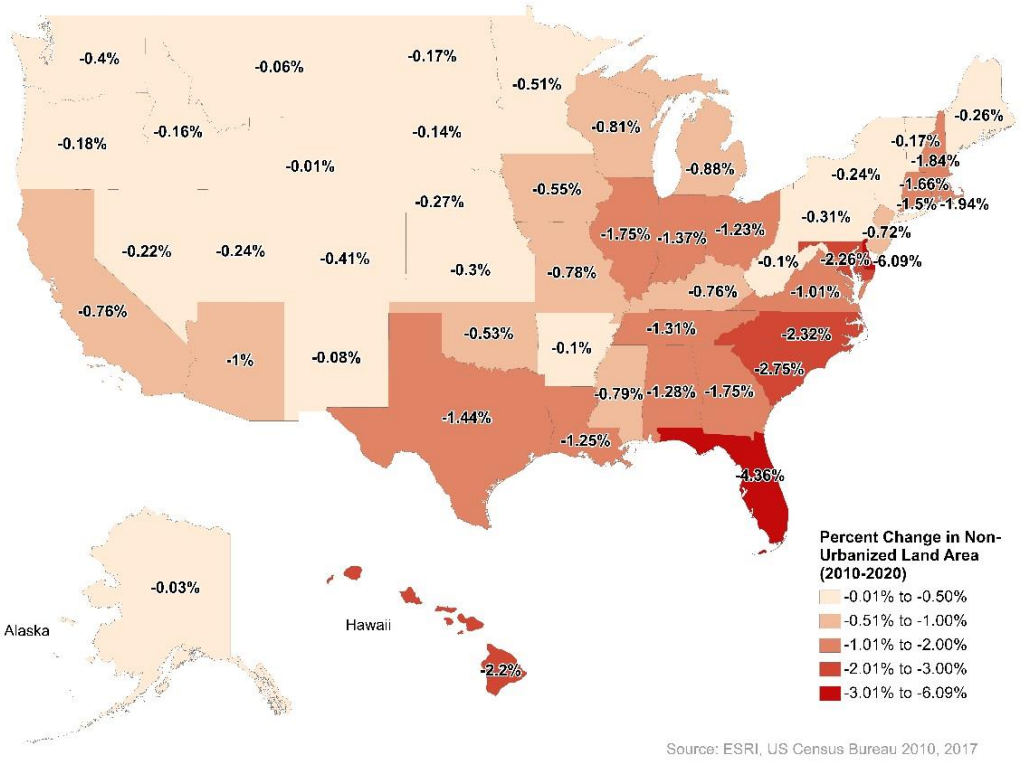


Figure 7 – Percent Change in Non-Urbanized Land Area under Scenario 1A by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

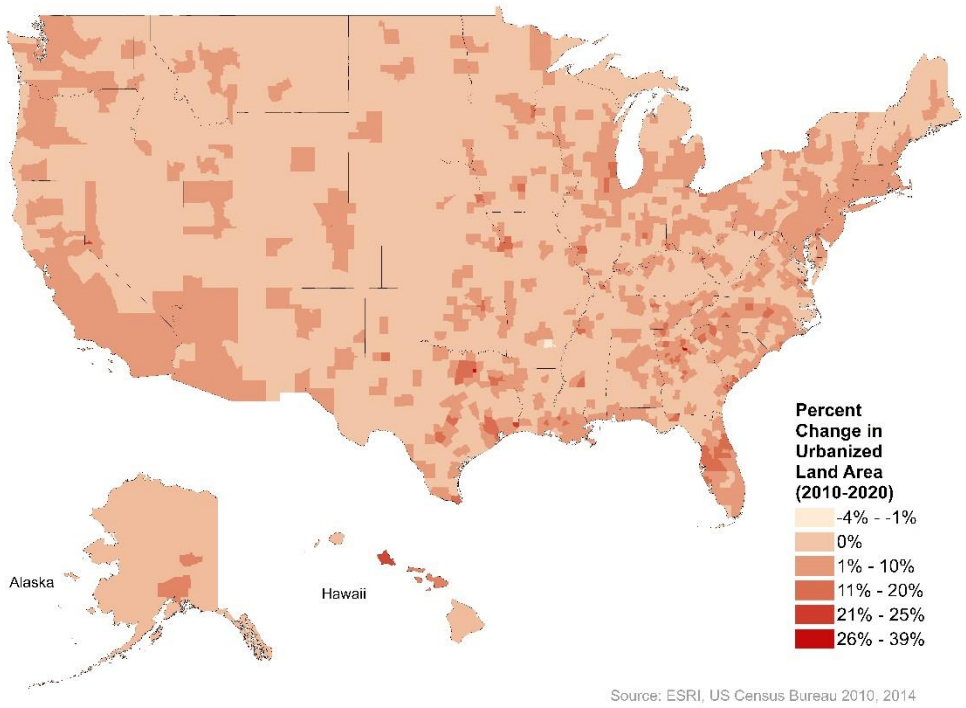


Figure 8 – Percent Change in Urbanized Land Area under Scenario 1A by between 2010 and 2020. Sources: ESRI, US Census Bureau 2010 & 2014

3.3.1.3 Predicted § 5311 Quotients after 2020 for Scenario 1A

As a result of these predicted shifts in non-urbanized population and land area, the overall FTA § 5311 Land Area & Population Quotients for all but three states (Hawaii, Georgia, and Rhode Island) are expected to change. Figure 9 illustrates the percent shift in each state's quotient based on the 2010 quotient percentages presented in Figure 4. A total of 26 states are predicted to have an increase in their FTA § 5311 population and land area quotients (ranging from 0.01 to 1.01%); this could likely lead to an increase in § 5311 funding for these states after the 2020 Census. Twenty-one (21) states are predicted

to have a reduced quotient for the § 5311 apportionment formula (ranging from -0.01 to -1.84%), indicating a likely reduction in the apportionment for these states after 2020.

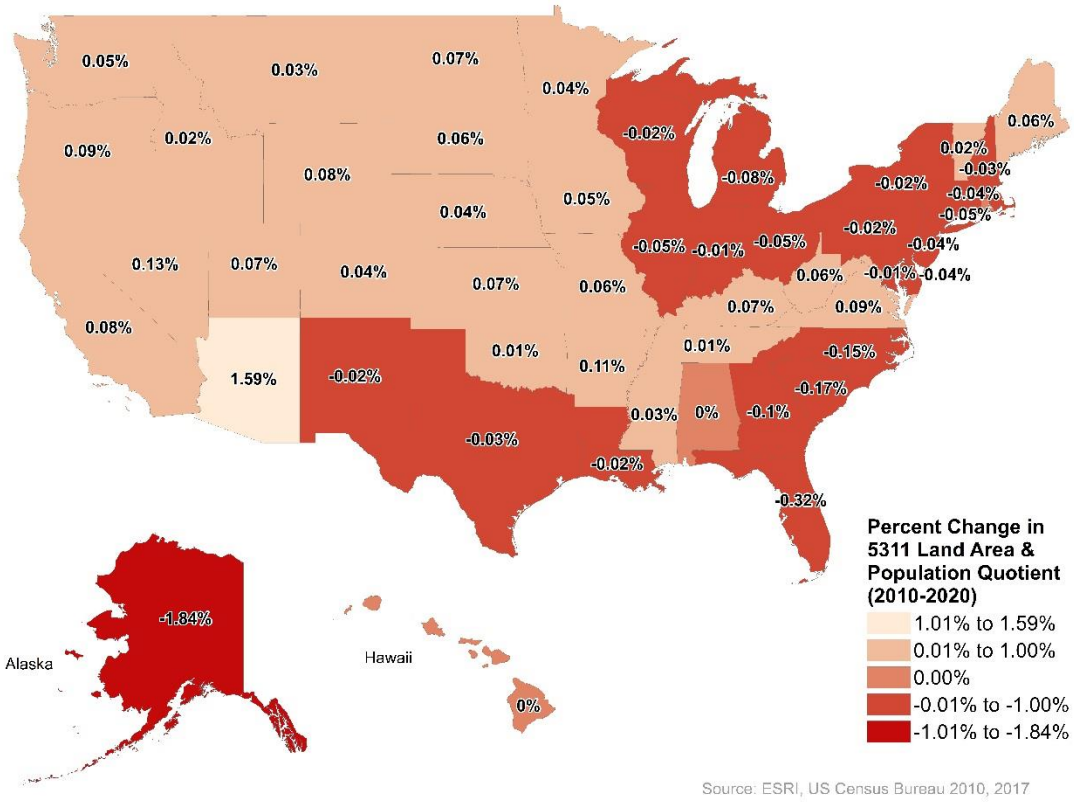


Figure 9. Percent Change in Land Area & Population Quotient under Scenario 1A for the FTA § 5311 formula by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

3.3.1.4 Application of Results

Florida can be used as an example for a state that is expected to have a reduced quotient for the § 5311 formula. Florida's regression model predicted urbanization correctly 93.5% of the time. Between 2010 and 2020, Florida is predicted to lose a total of 3% of its non-urbanized population and 4.36% of its non-urbanized area under this scenario. This can also be interpreted as the state is predicted to gain both urbanized population and land area over the 10-year period, or, simply put, the state is predicted to

become more urban. In 2010, the state held 2.65% of the country's total non-urbanized population and 1.36% of the country's non-urbanized land area. In 2020, for Scenario 1A, these percentages were calculated to be 2.25% and 1.39%, respectively. Florida's total share of non-urbanized population is predicted to drop, although its share of the nation's non-urbanized actually was predicted to increase. So, even though the state's raw quantity of square miles is predicted to decrease (46,790 mi^2 to 44.465 mi^2), the percentage is predicted to increase because there was an overall loss in non-urbanized land area throughout the country (245,851 mi^2 in total).

The population component to Florida's § 5311 quotient (80% of the state's relative national share of non-urbanized population) was reduced from 2.12% to 1.8% in 2020. The land area component of the § 5311 quotient (20% of the state's relative national share of non-urbanized land area) increased by 0.01% for the reasons listed above. This goes to say that a state's portion of non-urbanized land area is a stronger determinant for its § 5311 apportionment total. Further, almost all of the states that were predicted to experience a decrease in their overall § 5311 quotients held a large share of the nation's non-urbanized population relative to the states that were not predicted to experience a decrease in § 5311 quotients. In other words, states that hold a large share of the nation's non-urbanized population and experienced a decrease in both non-urbanized population and land area between 2010 and 2020 were modeled to have a decrease in the § 5311 quotient.

3.3.2 Scenario 2B: 75% Probability & Within 0 Miles

Scenario 2B allows for the merging of an UC with either another UC or an UA if the blocks within the UC have at least a 75% probability of being classified as urban after

the 2020 Census and the UC shares contiguous borders (a distance of 0.0 miles) with an existing UC/UA. This scenario is the lower boundary estimate for urbanization (showing the minimum predicted urbanization) under the current Census urbanization rules.

Under this scenario, the total number of UCS/UAs was reduced to 3,560 from 3,573 UCS/UAs in 2010. A total of 6 UCs were predicted to undergo a "high-risk" transition from UC to a Large Urban UA (see highlighted rows in Table 4). A total of 8 UCs were predicted to merge into another UC, and a total of 6 UCs were predicted to merge into a Small Urban UA. The list of UCs and their respective mergers are shown below in Table 4.

Table 4. List of Urban Clusters Predicted to Merge under Scenario 2B (US Census Bureau 2010).

State	2010 Urban Cluster	Name of UC/UA Predicted to Merge Into	UC/UA LSAD
Alabama	Priceville, AL	Decatur, AL	UA
Connecticut	Willimantic, CT	Hartford, CT	UA
Delaware	Bridgeville, DE	Salisbury, MD--DE	UA
Florida	Crystal River, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Fernandina Beach, FL	Yulee, FL	UC
	Four Corners, FL	Winter Haven, FL	UA
	Panama City Northeast, FL	Panama City, FL	UA
	Poinciana, FL	Kissimmee, FL	UA
	Yulee, FL	Fernandina Beach, FL	UC
Georgia	Winder, GA	Atlanta, GA	UA
Louisiana	Donaldsonville, LA	Houma, LA	UA
New Jersey	Newton, NJ	New York--Newark, NY--NJ--CT	UA
Ohio	Ashtabula, OH	Conneaut, OH	UC
	Conneaut, OH	Ashtabula, OH	UC
Pennsylvania	Jersey Shore, PA	Lock Haven, PA	UC

	Lock Haven, PA	Jersey Shore, PA	UC
	Lykens, PA	Williamstown, PA	UC
	Roaring Spring, PA	Altoona, PA	UA
	Williamstown, PA	Lykens, PA	UC
Virginia	Purcellville, VA	Washington, DC--VA--MD	UA

3.3.2.1 Non-Urbanized Population Under Scenario 2B

Our models predict the national total non-urbanized population to grow by 2,832,743 people in this scenario, which amounts to a 3.18% overall increase in non-urbanized population between 2010 and 2020 for Scenario 2B. States include Delaware, Maine, Rhode Island, and Hawaii all were predicted to experience increases in non-urbanized population between 2010 and 2020. As for Alaska, North Dakota, and Idaho, these states are predicted to lose over 5% of their non-urbanized populations. The county level percent-urbanized population change map (Figure 11) shows these states contain a county that is projected to decrease in urbanized population by at least 41 and at most 90 percent. The counties outlined in blue, 22 in total, indicate the counties that grew from having an urbanized population of less than 50% to over 50% after 2020. Further, a total of 19 counties grew to over 89% urbanized population between 2010 and 2020, making these counties principally urban (according to Census Bureau) after the 2020 Census. In Figure 11, these counties are represented by a yellow crosshatch.

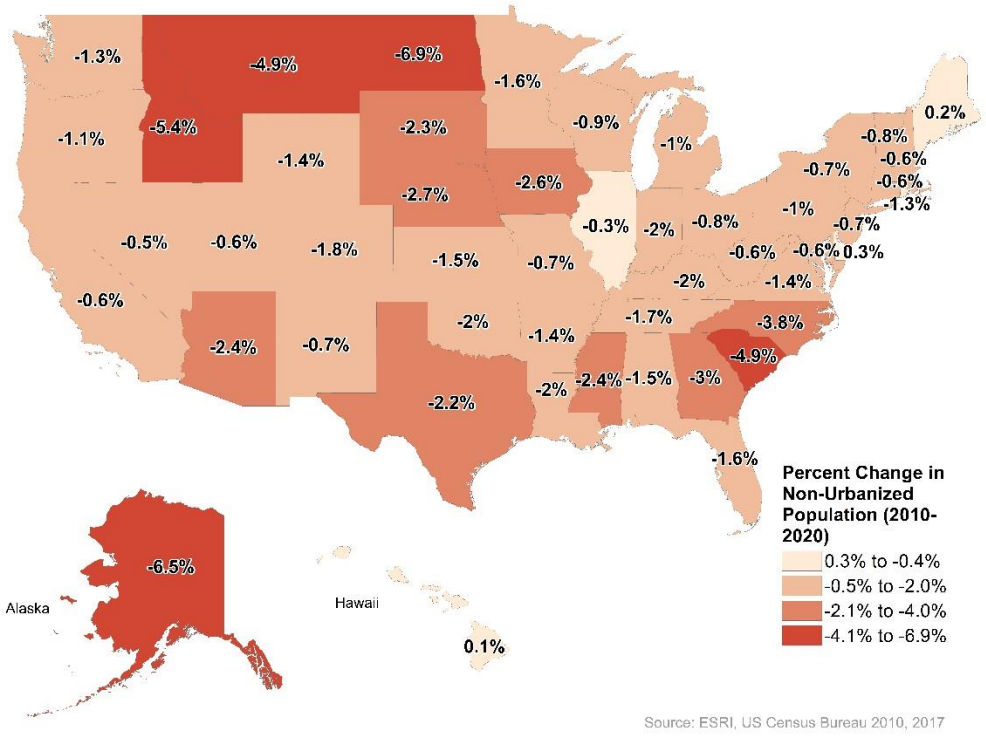


Figure 10. Percent Change in Non-Urbanized Population under Scenario 2B by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

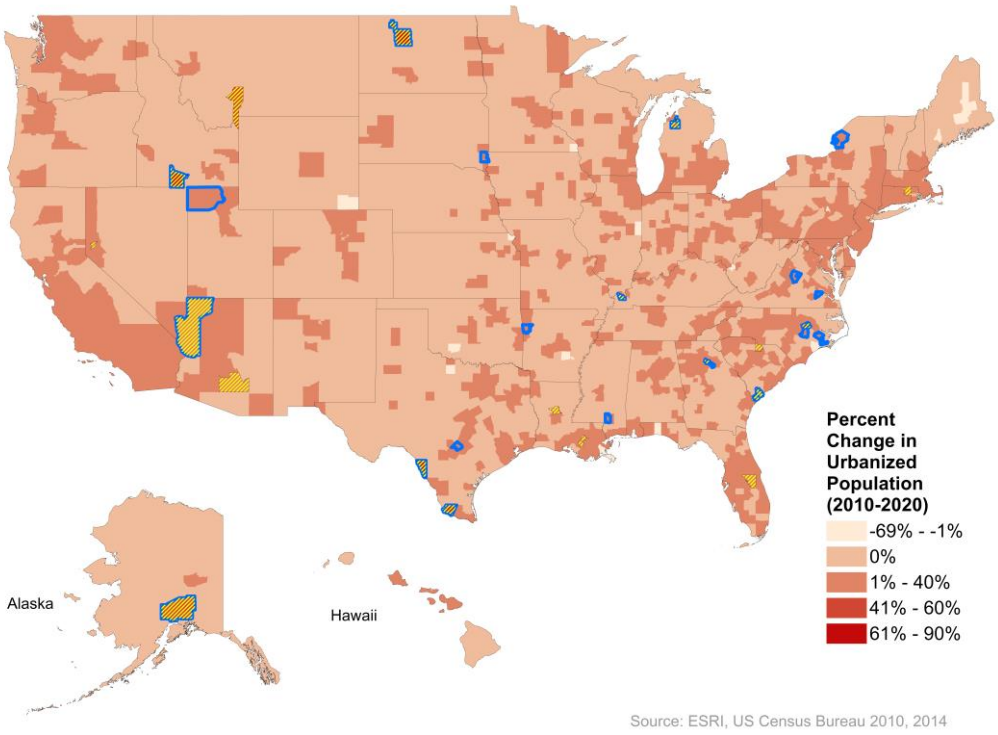


Figure 11. Percent Change in Urbanized Population under Scenario 2B by County between 2010 and 2020; Counties Predicted to Grow to More Than 50% Urbanized Population (Blue); Counties Predicted to Increase more than 10% in Urbanized Population (Yellow Crosshatch). Sources: ESRI, US Census Bureau 2010 & 2014

3.3.2.2 Non-Urbanized Land Area Under Scenario 2B

For Scenario 2B, non-urbanized land area across the US was reduced by 6.55% between 2010 and 2020. This change is illustrated by state in Figure 12. Connecticut (-0.73%), Delaware (-0.59%), and Massachusetts (-0.52%) experienced a decrease in non-urbanized land area of more than -0.5%. At the county level (see Figure 13), almost all of the counties in these states were predicted to experience an increase in urbanized land area between 1% and 10%.

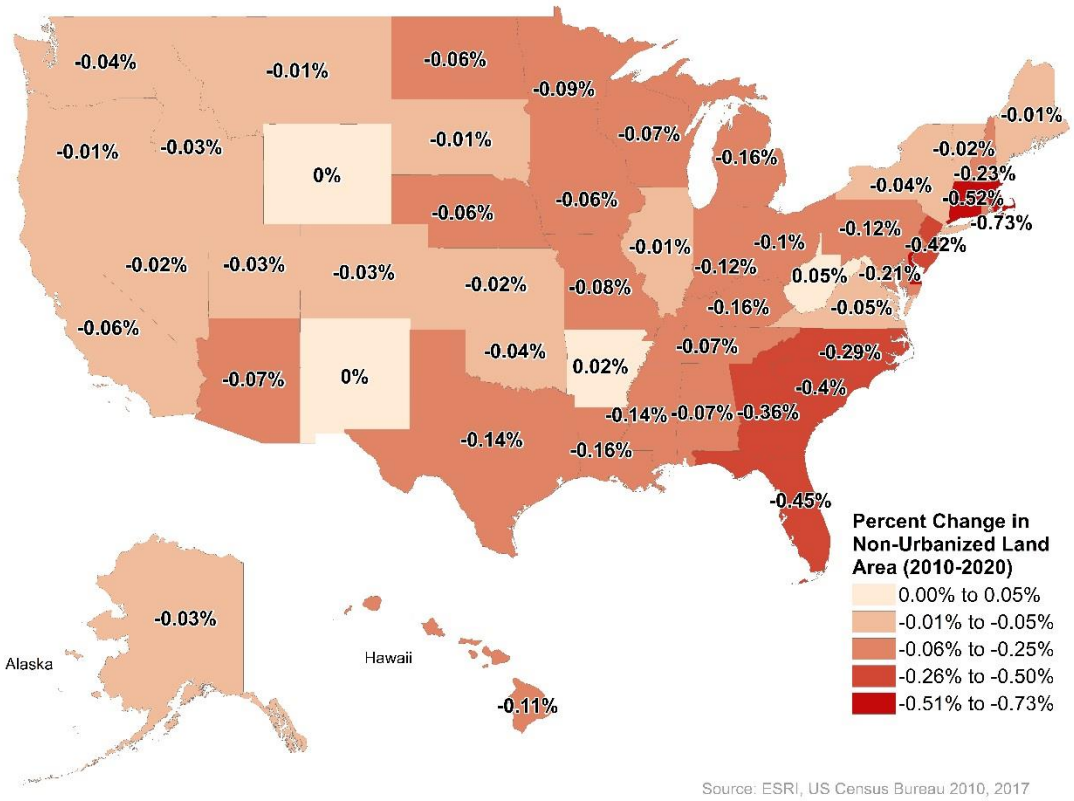


Figure 12. Percent Change in Non-Urbanized Land Area under Scenario 2B by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

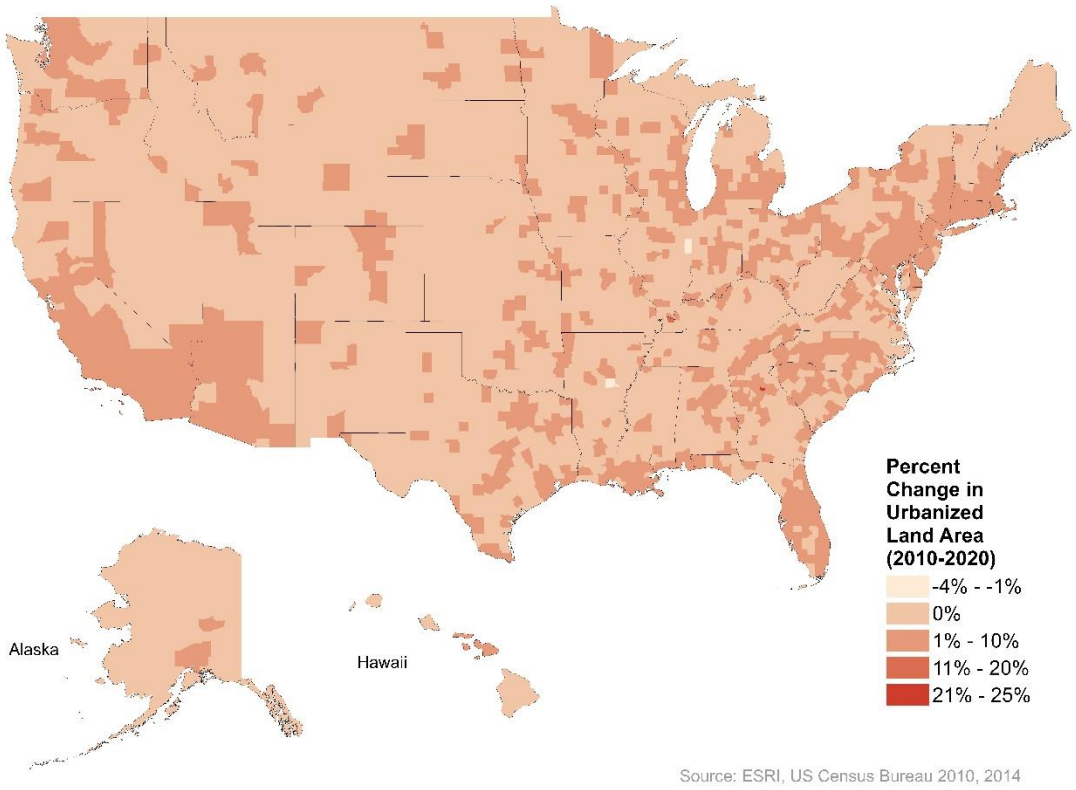


Figure 13. Percent Change in Urbanized Land Area under Scenario 2B by County between 2010 and 2020. Sources: ESRI, US Census Bureau 2010 & 2014

3.3.2.3 Predicted § 5311 Quotients after 2020 for Scenario 2B

As a result of these predicted shifts in non-urbanized population and land area, the overall FTA § 5311 Land Area & Population Quotients for all but four states (Idaho, Maryland, Vermont, and Rhode Island) are expected to change. Figure 14 illustrates the percent shift in each state's quotient based on the 2010 quotient percentages presented in Figure 4. Similar to Scenario 1A, a total of 28 states are predicted to have an increased § 5311 land area and population quotient (ranging from 0.01% to 1.01%), whereas 18 states are predicted to have a reduced quotient (ranging from -0.01 to -1.86%). Generally, the same states are predicted to have a reduced § 5311 quotient as in Scenario 1A, although

to a lesser degree, with the exception of New Mexico, Texas, Louisiana, Maryland, Delaware, and New Hampshire. Additionally, Mississippi and Iowa are predicted to have a reduced § 5311 population and land area quotient in Scenario 2B, whereas in Scenario 1A, both states were predicted to have an increased § 5311 quotient.

As with Scenario 1A, all of the states predicted to have a reduced § 5311 population and land area quotient after 2020 are concentrated in the eastern part of the US (with the exception of Alaska). This could be correlated with the size of the counties in this area of the country, which are much smaller in terms of land area than counties in the western state. Counties with a large land area will inherently have smaller population densities relative to the population densities in counties with a small total land area. The eastern states shaded in dark orange (-0.01% to -0.97%) that have small land areas are more vulnerable to shifts in population.

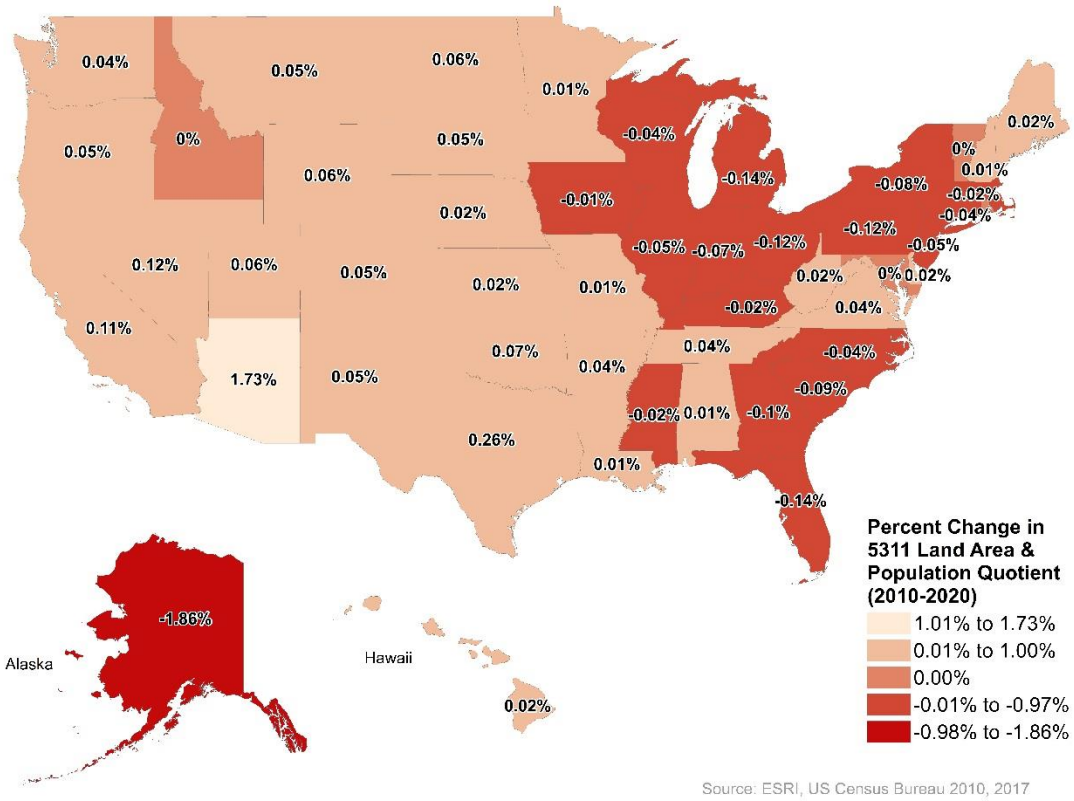


Figure 14 – Percent Change in Land Area & Population Quotient under Scenario 2B for the FTA § 5311 formula by State between 2010 and 2020. Data Sources: ESRI, US Census Bureau 2010 & 2017

3.3.2.4 Application of Results

Under Scenario 2B, Michigan is expected to have a 0.14% decrease in its § 5311 population and land area quotient. Similar trends to those in Florida under Scenario 1A are predicted to occur in Michigan under this scenario. Michigan's non-urbanized population is predicted to decrease by nearly 77,000 people, which equates to a 0.2% drop in the state's national share of non-urbanized population (dropping to 3.53% from 3.73%). Michigan's national share of non-urbanized land area is predicted to remain fairly constant (only losing 70 square miles of rural land area), but its percent share actually increased from 1.55% to 1.66%. This is due to the predicted overall loss of

national non-urbanized area, which decreases the denominator. This is the same trend modeled under Scenario 1A, but with a lesser degree of a change in quotients.

3.3.3 Internal UC/UA Growth

An existing UC or UA can urbanize without merging/gaining urbanized land area. Urbanization occurs also through population growth inside of the existing UC/UA boundaries, referred to here as internal growth. The following tables show sets of internal growth: 1) UCs shifting into Small Urban UAs (Tables 5 and 6), and 2) Small Urban UAs shifting into Large Urban UAs (Tables 7 and 8). Even if an UC is not predicted to merge in one of the scenarios discussed in this thesis, it could still be subject to urbanization through internal growth. UCs that are candidates for both merging and internal growth are of particular concern for this thesis.

3.3.3.1 Urban Cluster to Small Urban Shift

Tables 5 and 6 include areas that were classified as UCs (under 50,000 people) in 2010, but are predicted to grow internally to have a population of greater than 50,000 in 2020. This growth would cause these areas to shift not only from being classified as UCs to Small Urban UAs, but also puts these areas at risk for transitioning from FTA § 5311 to § 5307 funding. The highlighted rows are UCs that have a projected population of 47,500 or greater (within a 5% margin of the Small Urban UA threshold) in 2020. It is important to consider these areas in this scenario to adjust for potential under-prediction by any of the state regression models.

For the 50% scenario (that is, blocks with a 50% or greater probability of being urban in 2020), a total of 22 UCs are predicted to grow internally to become Small Urban

UAs, with an additional 11 UCs within a 5% margin of the threshold. These areas highlighted in Table 5. Five of the UCs listed in Table 5 are also listed to merge under Scenario 1A. These UCs include:

1. Bullhead City, AZ—NV; predicted to merge with the Laughlin, NV UC
2. Poinciana, FL; predicted to merge with the Kissimmee, FL UA; also listed as a Rural to Large Urban transition
3. Winder, GA; predicted to merge with the Atlanta, GA UA; also listed as a Rural to Large Urban transition
4. Bozeman, MT; predicted to merge with the Belgrade, MT UC
5. Sandusky, OH; predicted to merge with the Small Urban Lorain—Elyria, OH

Table 5. Urban Clusters Predicted to Grow into a Small Urban UAs under the 50% Urbanization Scenario. (US Census Bureau 2010).

State Name	2010 UC Name	2010 Population	2020 Population
Alaska	Lakes--Knik-Fairview--Wasilla, AK	44,236	59,230
Arizona	Maricopa, AZ	42,337	52,364
	Sahuarita--Green Valley, AZ	40,691	50,100
	Bullhead City, AZ--NV	48,656	54,463
California	Hollister, CA	42,002	47,984
	Reedley--Dinuba, CA	46,247	53,208
Florida	Poinciana, FL	41,922	50,426
Georgia	Carrollton, GA	42,872	49,187
	Winder, GA	37,831	49,220
Idaho	Twin Falls, ID	48,836	56,333
Kansas	Salina, KS	47,493	48,714
Kentucky	Paducah, KY--IL	48,791	51,043
Michigan	Traverse City, MI	47,109	51,396
Montana	Bozeman, MT	43,164	53,030
	Helena, MT	45,055	51,073
North Carolina	Morehead City, NC	44,798	50,989
	Wilson, NC	49,190	51,605

North Dakota	Minot, ND	42,650	59,936
New Mexico	Clovis, NM	41,570	50,077
	Roswell, NM	49,727	50,283
Ohio	Findlay, OH	48,441	48,649
	Marion, OH	46,384	47,978
	New Philadelphia--Dover, OH	46,366	48,732
	Sandusky, OH	48,990	48,157
Oklahoma	Enid, OK	47,609	50,694
	Stillwater, OK	44,515	50,585
South Carolina	Beaufort--Port Royal, SC	48,807	56,087
Tennessee	Cookeville, TN	44,207	50,567
Texas	Eagle Pass, TX	49,236	54,707
	Galveston, TX	44,022	47,782
	Lufkin, TX	44,927	49,527
	Rio Grande City--Roma, TX	46,344	57,116
Virginia	Danville, VA--NC	49,344	49,698

The UCs at risk for transitioning from UC to Small Urban UA under the 75% scenario are listed in Table 6. A total of 14 UCs are predicted to grow to over 50,000 people, with an additional 15 UCs that have a population within a 5% margin of the UA threshold. Of the 29 UCs in Table 6, both Poinciana, FL and Winder, GA are also listed to merge (listed with the same mergers as under the 50% scenario above; both Rural to Large Urban transitions). Four of these UCs are predicted to merge under the Scenario 2A (75% probability and within ½ mile of an existing UC/UA): Bullhead City, AZ—NV; Poinciana, FL; Winder, GA; Bozeman, MT; and Sandusky, OH (all with the same mergers listed above).

Table 6 – Urban Clusters Predicted to Grow into a Small Urban UAs under the 75% Urbanization Scenario. (US Census Bureau 2010).

State Name	2010 UC Name	2010 Population	2020 Population
Alaska	Lakes--Knik-Fairview--Wasilla, AK	44,236	54,630

Arizona	Maricopa, AZ	42,337	51,773
	Sahuarita--Green Valley, AZ	40,691	49,217
	Bullhead City, AZ--NV	48,656	53,336
California	Reedley--Dinuba, CA	46,247	52,360
Florida	Poinciana, FL	41,922	50,419
Georgia	Carrollton, GA	42,872	47,695
Idaho	Twin Falls, ID	48,836	55,300
Kansas	Salina, KS	47,493	48,393
Kentucky	Paducah, KY--IL	48,791	50,349
Michigan	Traverse City, MI	47,109	50,151
Montana	Bozeman, MT	43,164	52,277
	Helena, MT	45,055	49,311
North Carolina	Morehead City, NC	44,798	49,031
	Wilson, NC	49,190	50,709
North Dakota	Minot, ND	42,650	58,639
New Mexico	Clovis, NM	41,570	49,657
	Roswell, NM	49,727	49,690
Ohio	Findlay, OH	48,441	48,049
	New Philadelphia--Dover, OH	46,366	47,974
	Sandusky, OH	48,990	47,882
Oklahoma	Enid, OK	47,609	49,753
	Stillwater, OK	44,515	49,451
South Carolina	Beaufort--Port Royal, SC	48,807	52,770
Tennessee	Cookeville, TN	44,207	48,756
Texas	Eagle Pass, TX	49,236	53,822
	Lufkin, TX	44,927	48,599
	Rio Grande City--Roma, TX	46,344	55,519
Virginia	Danville, VA--NC	49,344	47,998

3.3.3.2 Small to Large Urban Shifts

There were no Small Urban UAs that were predicted to grow internally to become Large Urban UAs. However, there were 7 SU UAs in the 50% Scenario and 10 SU UAs in the 75% Scenario that were within a population margin of 9,000 people (4%). These

UAs are listed in Tables 7 and 8. Under both scenarios, Waterbury, CT is also listed to merge with the Large Urban Hartford, CT UA under Scenarios 1C and 2C (UA merging if within 0 miles/contiguous of an existing UA). The North Point—Port Charlotte, FL UA is listed under Scenario 1C to merge with the Large Urban Sarasota—Bradenton, FL UA.

Table 7. Small Urban UAs Close to Growing into a Large Urban UA under the 50% Urbanization Scenario. (US Census Bureau 2010).

UA Name	2010 Population	2020 Population
Erie, PA	196,611	198,502
Olympia--Lacey, WA	176,617	198,491
Clarksville, TN--KY	158,655	197,088
Waterbury, CT	194,535	194,196
Sioux Falls, SD	156,777	193,979
North Port--Port Charlotte, FL	169,541	193,968
Cedar Rapids, IA	177,844	192,891

Table 8. Small Urban UAs Close to Growing into a Large Urban UA under the 75% Urbanization Scenario. (US Census Bureau 2010).

UA Name	2010 Population	2020 Population
College Station--Bryan, TX	171,345	198,928
Gainesville, FL	187,781	198,031
Erie, PA	196,611	197,945
Olympia--Lacey, WA	176,617	197,011
Salinas, CA	184,809	196,981
Deltona, FL	182,169	196,173
Waterbury, CT	194,535	193,993
Waco, TX	172,378	193,527
Clarksville, TN--KY	158,655	193,514
Sioux Falls, SD	156,777	191,214

CHAPTER 4. DISCUSSION AND FUTURE RESEARCH

4.1 Urbanization and FTA § 5311 Apportionments After 2020

To address the research question about identifying the areas in which urbanization may occur between 2010 and 2020, an extensive regression analysis and urbanization scenarios were used. The percent change in non-urbanized population ranged from -1.91% to 3.18% for Scenarios 1A, 1B, 2A, and 2B. The same scenarios predicted a percent change in non-urbanized land area ranging from -6.52% to -7.13%.

In summary, the models generally show urbanization occurring in states with a predicted rapid loss of population in rural areas and those states with a small national share of rural land area. These states are predominantly clustered in the eastern half of the contiguous US. For the states predicted to have high-risk transitions (rural UC merging large urban UA), the transit systems located within these areas will be acutely affected by urbanization. These states are predicted to have a decrease in overall § 5311 apportionment after the 2020 Census. In turn, a potential loss in funding can have a negative impact on rural transit systems located in newly urbanized areas. This issue stems from the FTA rule which requires that rural transit systems that receive § 5311 funding must provide service to, from, or within a rural area (areas with a population of less than 50,000). A transit system that services areas that were classified as rural (or non-urbanized) per the 2010 Census, but urbanized and shifted to become urban after the 2020 Census, this would disqualify the transit system from receiving funding through the § 5311 formula grant (FTA, 2018, § 5311-1).

For transit systems under this predicament, there are also barriers for systems in newly urban areas in initiating funding through the § 5307 UA formula grant. Before receiving § 5307 funding for urban transit service, a system has to have reported one full year of urban service, through the use of urban vehicle revenue miles, to NTD. NTD then takes another year to validate this report, only after which can a transit system receive and use § 5307 funding. For newly urbanized transit systems, this process in conjunction with the aforementioned § 5311 rule will prevent the system from receiving neither § 5311 or § 5307 funds for public transit. Other changes associated with a transition from § 5311 to § 5307 funding include more extensive reporting requirements, different apportionment processes, and stipulations for use of funding – namely, the reduced portion of § 5307 funds that can be used towards operating expenses. All of these changes have the potential to affect newly urbanized transit systems ability to continue operations and providing service.

4.2 **Applications of Research**

The quotients presented in this analysis can be particularly useful for state DOTs to calculate estimated FTA § 5311 apportionment after the 2020 Census. In comparison to the state's 2010 § 5311 apportionment, state DOTs can determine if there will be a potential loss in funding, which could lead to a funding gap. State transportation agencies can begin planning for a potential funding gap by identifying additional funding sources and coordinating with MPOs to help newly urbanized rural transit systems transition into becoming an urban transit provider. For marginally urbanizing states that are not predicted to have a large shift in the § 5311 population and land area quotient, these predictions could be useful to identify urbanization trends within the state, and plan for

the effects thereof beyond the 2020 Census. It is important for users of these predictions to consider the range of urbanization and quotient inputs, as they are not perfect representations of the future. Furthermore, Congress could offset any reductions in state-level allocations with greater appropriations to rural programs.

A more focused planning effort may be required of transportation planners to prepare for rural transit systems to undergo a shift in federal funding. Especially given the prevalence of this urbanization issue was not widespread after the 2010 Census. A more defined path to initiating FTA § 5307 funding for newly urbanized transit systems will be key in a successful transition where service is not affected. While the focus of this research was to hypothesize the effects of urbanization on federal rural transit funding, the urbanization trends presented in this thesis could be valuable to many different disciplines outside of transportation planning.

4.3 **Next Steps**

An extensive evaluation of the FTA § 5311 funding formula was not completed for this thesis. Extended evaluation of the formula in conjunction with the findings presented here could be helpful in determining if amendments to the § 5311 formula are appropriate. Other remedies for the trending urban issue could also include an amendment to the "100 bus rule" to change the urban vehicle revenue miles requirement or proposing a new "trending urban" rule altogether. Preliminarily, state agencies and MPOs can work to identify a contingent source of funding to ensure rural transit systems can continue service despite envelopment or growth into a UA. Given the novelty and limited documentation of the trending urban issue, the 2020 Census will provide data that is important for future research about urbanization and its impacts on federal funding for

rural transit, among other applications. Certainly, after the 2020 Census, the extent of this rural transit funding dilemma will be realized and the solution to this trending urban issue will become more apparent.

APPENDIX A. ADDITIONAL TABLES FOR ALL SCENARIOS

A.1 Scenario 1A (50% & ½ Mile) – All Mergers Table

State	2010 Urban Cluster	Name of UC/UA Predicted to Merge Into	UC/UA LSAD
Alabama	Athens, AL	Huntsville, AL	UA
	Grand Bay, AL	Mobile, AL	UA
	Hazel Green, AL	Huntsville, AL	UA
	Priceville, AL	Decatur, AL	UA
	Robertsdale, AL	Daphne--Fairhope, AL	UA
Arizona	Buckeye, AZ	Avondale--Goodyear, AZ	UA
	Bullhead City, AZ--NV	Laughlin, NV	UC
	Lake of the Woods--Pinetop-Lakeside, AZ	Show Low, AZ	UC
	Marana West, AZ	Tucson, AZ	UA
	Nogales, AZ	Rio Rico Northeast, AZ	UC
	Rio Rico Northeast, AZ	Nogales, AZ	UC
	Show Low, AZ	Lake of the Woods--Pinetop-Lakeside, AZ	UC
	Somerton, AZ	Yuma, AZ--CA	UA
	Vail, AZ	Tucson, AZ	UA
	Vistancia, AZ	Phoenix--Mesa, AZ	UA
California	Auburn--North Auburn, CA	Sacramento, CA	UA
	Carmel Valley Village, CA	Seaside--Monterey, CA	UA
	Cottonwood, CA	Redding, CA	UA
	Forestville, CA	Santa Rosa, CA	UA
	Galt, CA	Lodi, CA	UA
	Half Moon Bay, CA	San Francisco--Oakland, CA	UA
	Mecca, CA	Indio--Cathedral City, CA	UA
	Nipomo, CA	Arroyo Grande--Grover Beach,	UA

		CA	
Colorado	Edwards, CO	Vail, CO	UC
	Firestone--Frederick, CO	Longmont, CO	UA
	Lochbuie, CO	Denver--Aurora, CO	UA
	Vail, CO	Edwards, CO	UC
Connecticut	Jewett City, CT	Worcester, MA--CT	UA
	Willimantic, CT	Hartford, CT	UA
Delaware	Bridgeville, DE	Salisbury, MD--DE	UA
	Georgetown, DE	Millsboro, DE	UC
	Middletown, DE	Philadelphia, PA--NJ--DE--MD	UA
	Milford, DE	Dover, DE	UA
	Millsboro, DE	Georgetown, DE	UC
	Ocean View, DE	Ocean Pines, MD--DE	UC
Florida	Crooked Lake Park, FL	Winter Haven, FL	UA
	Crystal River, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Fernandina Beach, FL	Yulee, FL	UC
	Four Corners, FL	Orlando, FL	UA
	Golden Gate Estates, FL	Bonita Springs, FL	UA
	Jupiter Farms, FL	Miami, FL	UA
	Panama City Northeast, FL	Panama City, FL	UA
	Poinciana, FL	Kissimmee, FL	UA
	Rainbow Lakes Estates, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Santa Rosa Beach, FL	Fort Walton Beach--Navarre--Wright, FL	UA
	Sugarmill Woods, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Wedgefield, FL	Orlando, FL	UA
	Yulee, FL	Fernandina Beach, FL	UC
Georgia	Buckhead (Bryan County), GA	Savannah, GA	UA
	Lula, GA	Gainesville, GA	UA

	Monroe, GA	Atlanta, GA	UA
	Winder, GA	Atlanta, GA	UA
Hawaii	Haleiwa--Waialua--Pupukea, HI	Urban Honolulu, HI	UA
	Pukalani--Makawao--Haiku-Pauwela, HI	Kahului, HI	UA
Idaho	Rathdrum, ID	Coeur d'Alene, ID	UA
Illinois	Lake Holiday, IL	Chicago, IL--IN	UA
	Murphysboro, IL	Carbondale, IL	UA
	Wonder Lake, IL	Round Lake Beach--McHenry--Grayslake, IL--WI	UA
Indiana	Charlestown, IN	Louisville/Jefferson County, KY--IN	UA
	Lowell, IN	Chicago, IL--IN	UA
Kentucky	Nicholasville, KY	Wilmore, KY	UC
	Wilmore, KY	Nicholasville, KY	UC
Louisiana	Donaldsonville, LA	Baton Rouge, LA	UA
	Galliano--Larose--Cut Off, LA	Houma, LA	UA
	Gramercy--Lutcher, LA	New Orleans, LA	UA
	Rayne, LA	Lafayette, LA	UA
Massachusetts	North Brookfield, MA	Worcester, MA--CT	UA
	North Adams, MA--VT	Pittsfield, MA	UA
Maryland	Glenwood, MD	Baltimore, MD	UA
	Manchester, MD	Baltimore, MD	UA
	Romancoke, MD	Baltimore, MD	UA
	Ocean Pines, MD--DE	Ocean View, DE	UC
Michigan	Cedar Springs, MI	Grand Rapids, MI	UA
	Fowlerville, MI	South Lyon--Howell, MI	UA
	Goodrich, MI	Detroit, MI	UA

	Paw Paw, MI	Kalamazoo, MI	UA
	Sparta, MI	Grand Rapids, MI	UA
Minnesota	Monticello--Big Lake, MN	Minneapolis--St. Paul, MN--WI	UA
	Stewartville, MN	Rochester, MN	UA
Missouri	Branson, MO	Forsyth, MO	UC
	Eureka, MO	St. Louis, MO--IL	UA
	Forsyth, MO	Branson, MO	UC
	Platte City, MO	Kansas City, MO--KS	UA
	Smithville North, MO	Kansas City, MO--KS	UA
	Willard, MO	Springfield, MO	UA
Mississippi	Canton, MS	Jackson, MS	UA
	Gautier, MS	Pascagoula, MS	UA
Montana	Belgrade, MT	Bozeman, MT	UC
	Bozeman, MT	Belgrade, MT	UC
	Laurel, MT	Billings, MT	UA
North Carolina	Archer Lodge--Clayton, NC	Raleigh, NC	UA
	Fearrington Village, NC	Durham, NC	UA
	Grifton, NC	Greenville, NC	UA
	Havelock, NC	New Bern, NC	UA
	Lake Norman of Catawba, NC	Charlotte, NC--SC	UA
	Maiden, NC	Hickory, NC	UA
	Oak Island, NC	St. James, NC	UC
	Pinehurst--Southern Pines, NC	Whispering Pines, NC	UC
	Smithfield, NC	Raleigh, NC	UA
	St. James, NC	Oak Island, NC	UC
	Wendell--Zebulon, NC	Raleigh, NC	UA
	Whispering Pines, NC	Pinehurst--Southern Pines, NC	UC
North Dakota	Lincoln, ND	Bismarck, ND	UA
Nebraska	Plattsmouth, NE	Omaha, NE--IA	UA
New Hampshire	Concord, NH	Manchester, NH	UA
	Epping, NH	Boston, MA--NH--RI	UA
New Jersey	Newton, NJ	New York--Newark, NY--NJ--	UA

		CT	
New Mexico	Aztec, NM	Farmington, NM	UA
	Kirtland, NM	Farmington, NM	UA
Nevada	Laughlin, NV	Bullhead City, AZ--NV	UC
New York	Bedford, NY	New York--Newark, NY--NJ--CT	UA
	Chester, NY	Poughkeepsie--Newburgh, NY--NJ	UA
	Lockport, NY	Buffalo, NY	UA
	Maybrook, NY	Walden, NY	UC
	Ravena, NY	Albany--Schenectady, NY	UA
	Walden, NY	Poughkeepsie--Newburgh, NY--NJ	UA
Ohio	Ashtabula, OH	Conneaut, OH	UC
	Conneaut, OH	Ashtabula, OH	UC
	Genoa, OH	Toledo, OH--MI	UA
	Sandusky, OH	Lorain--Elyria, OH	UA
Oklahoma	Claremore, OK	Tulsa, OK	UA
	Collinsville, OK	Tulsa, OK	UA
	Harrah, OK	Oklahoma City, OK	UA
Oregon	Aumsville, OR	Salem, OR	UA
Pennsylvania	Burgettstown, PA	Pittsburgh, PA	UA
	Fairdale, PA	Masontown, PA	UC
	Jersey Shore, PA	Lock Haven, PA	UC
	Lock Haven, PA	Jersey Shore, PA	UC
	Lykens, PA	Williamstown, PA	UC
	Masontown, PA	Fairdale, PA	UC
	Quarryville, PA	Lancaster, PA	UA
	Roaring Spring, PA	Altoona, PA	UA
	Saw Creek, PA	East Stroudsburg, PA--NJ	UA
	Williamstown, PA	Lykens, PA	UC
South Carolina	Camden, SC	Columbia, SC	UA
	Chesnee, SC	Spartanburg, SC	UA
	Clover, SC	Rock Hill, SC	UA
	Lake Murray North Shore, SC	Columbia, SC	UA

	Seneca, SC	Greenville, SC	UA
	Sun City Hilton Head, SC	Hilton Head Island, SC	UA
	York, SC	Rock Hill, SC	UA
South Dakota	Brandon, SD	Sioux Falls, SD	UA
	Harrisburg, SD	Sioux Falls, SD	UA
Tennessee	Arlington, TN	Memphis, TN--MS--AR	UA
	Atoka, TN	Memphis, TN--MS--AR	UA
	Jasper, TN	South Pittsburg, TN--AL	UC
	Norris, TN	Knoxville, TN	UA
	White Pine, TN	Morristown, TN	UA
	South Pittsburg, TN--AL	Jasper, TN	UC
Texas	Aledo, TX	Weatherford, TX	UC
	Alvarado, TX	Dallas--Fort Worth--Arlington, TX	UA
	Anna, TX	McKinney, TX	UA
	Boerne, TX	San Antonio, TX	UA
	Canyon, TX	Mescalero Park, TX	UC
	Cleburne, TX	Dallas--Fort Worth--Arlington, TX	UA
	Cleveland, TX	Houston, TX	UA
	Deerwood, TX	Conroe--The Woodlands, TX	UA
	Denton Southwest, TX	Denton--Lewisville, TX	UA
	Devine, TX	Lytle, TX	UC
	Forney, TX	Dallas--Fort Worth--Arlington, TX	UA
	Granbury, TX	Pecan Plantation, TX	UC
	Grangerland, TX	Houston, TX	UA
	Hempstead, TX	Prairie View, TX	UC
	Homesteads Addition, TX	Dallas--Fort Worth--Arlington, TX	UA
	Justin, TX	Dallas--Fort Worth--Arlington, TX	UA
	Lake Conroe Eastshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Northshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Westshore, TX	Conroe--The Woodlands, TX	UA
	Lytle, TX	Devine, TX	UC
	Magnolia, TX	Houston, TX	UA

	Manor, TX	Austin, TX	UA
	Mescalero Park, TX	Canyon, TX	UC
	Odem, TX	Corpus Christi, TX	UA
	Paloma Creek South--Paloma Creek, TX	Dallas--Fort Worth--Arlington, TX	UA
	Pecan Acres, TX	Dallas--Fort Worth--Arlington, TX	UA
	Pecan Plantation, TX	Granbury, TX	UC
	Prairie View, TX	Hempstead, TX	UC
	Rio Hondo, TX	Harlingen, TX	UA
	Seguin, TX	San Antonio, TX	UA
	Springtown, TX	Dallas--Fort Worth--Arlington, TX	UA
	Weatherford, TX	Aledo, TX	UC
Utah	Park City, UT	Summit Park, UT	UC
	Santaquin, UT	Provo--Orem, UT	UA
	Summit Park, UT	Park City, UT	UC
Virginia	Purcellville, VA	Washington, DC--VA--MD	UA
Vermont	Milton, VT	Burlington, VT	UA
Washington	Granite Falls, WA	Marysville, WA	UA
	Indianola, WA	Bremerton, WA	UA
	Snoqualmie, WA	Seattle, WA	UA
Wisconsin	Burlington, WI	Milwaukee, WI	UA
	Lake Geneva, WI	Walworth, WI	UC
	Mukwonago, WI	Milwaukee, WI	UA
	Union Grove, WI	Racine, WI	UA
	Walworth, WI	Lake Geneva, WI	UC
	Hudson, WI--MN	Minneapolis--St. Paul, MN--WI	UA

A.2 Scenario 1B (50% & 0 Miles) – All Mergers Table

State	2010 Urban Cluster	Name of UC/UA Predicted to Merge Into	UC/UA LSAD
Alabama	Grand Bay, AL	Mobile, AL	UA
	Hazel Green, AL	Huntsville, AL	UA
	Priceville, AL	Decatur, AL	UA
	Robertsdale, AL	Daphne--Fairhope, AL	UA
Arizona	Buckeye, AZ	Avondale--Goodyear, AZ	UA
	Somerton, AZ	Yuma, AZ--CA	UA
California	Carmel Valley Village, CA	Seaside--Monterey, CA	UA
	Galt, CA	Lodi, CA	UA
	Nipomo, CA	Arroyo Grande--Grover Beach, CA	UA
Colorado	Firestone--Frederick, CO	Longmont, CO	UA
	Lochbuie, CO	Denver--Aurora, CO	UA
Connecticut	Willimantic, CT	Hartford, CT	UA
Delaware	Bridgeville, DE	Salisbury, MD--DE	UA
	Georgetown, DE	Millsboro, DE	UC
	Middletown, DE	Philadelphia, PA--NJ--DE--MD	UA
	Milford, DE	Dover, DE	UA
	Millsboro, DE	Georgetown, DE	UC
	Ocean View, DE	Ocean Pines, MD--DE	UC
Florida	Crystal River, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Fernandina Beach, FL	Yulee, FL	UC
	Four Corners, FL	Orlando, FL	UA
	Panama City Northeast, FL	Panama City, FL	UA
	Poinciana, FL	Kissimmee, FL	UA
	Sugarmill Woods, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Yulee, FL	Fernandina Beach, FL	UC
Georiga	Winder, GA	Atlanta, GA	UA

Hawaii	Haleiwa--Waialua--Pupukea, HI	Urban Honolulu, HI	UA
	Pukalani--Makawao--Haiku-Pauwela, HI	Kahului, HI	UA
Illinois	Lake Holiday, IL	Chicago, IL--IN	UA
	Murphysboro, IL	Carbondale, IL	UA
Indiana	Charlestown, IN	Louisville/Jefferson County, KY--IN	UA
Louisiana	Donaldsonville, LA	Baton Rouge, LA	UA
	Gramercy--Lutcher, LA	New Orleans, LA	UA
Maryland	Ocean Pines, MD--DE	Ocean View, DE	UC
Michigan	Cedar Springs, MI	Grand Rapids, MI	UA
	Paw Paw, MI	Kalamazoo, MI	UA
Minnesota	Monticello--Big Lake, MN	Minneapolis--St. Paul, MN--WI	UA
Missouri	Platte City, MO	Kansas City, MO--KS	UA
	Smithville North, MO	Kansas City, MO--KS	UA
Mississippi	Canton, MS	Jackson, MS	UA
	Gautier, MS	Pascagoula, MS	UA
Montana	Laurel, MT	Billings, MT	UA
North Carolina	Archer Lodge--Clayton, NC	Smithfield, NC	UC
	Fearrington Village, NC	Durham, NC	UA
	Grifton, NC	Greenville, NC	UA
	Havelock, NC	New Bern, NC	UA
	Lake Norman of Catawba, NC	Charlotte, NC--SC	UA
	Smithfield, NC	Archer Lodge--Clayton, NC	UC
North Dakota	Lincoln, ND	Bismarck, ND	UA
New Hampshire	Concord, NH	Manchester, NH	UA
	Epping, NH	Boston, MA--NH--RI	UA
New Jersey	Newton, NJ	New York--Newark, NY--NJ--CT	UA
Ohio	Ashtabula, OH	Conneaut, OH	UC
	Conneaut, OH	Ashtabula, OH	UC
Oklahoma	Collinsville, OK	Tulsa, OK	UA
Pennsylvania	Jersey Shore, PA	Lock Haven, PA	UC
	Lock Haven, PA	Jersey Shore, PA	UC
	Lykens, PA	Williamstown, PA	UC

	Roaring Spring, PA	Altoona, PA	UA
	Saw Creek, PA	East Stroudsburg, PA--NJ	UA
	Williamstown, PA	Lykens, PA	UC
South Carolina	Chesnee, SC	Spartanburg, SC	UA
	York, SC	Rock Hill, SC	UA
South Dakota	Brandon, SD	Sioux Falls, SD	UA
	Harrisburg, SD	Sioux Falls, SD	UA
Tennessee	Arlington, TN	Memphis, TN--MS--AR	UA
Texas	Boerne, TX	San Antonio, TX	UA
	Cleburne, TX	Dallas--Fort Worth--Arlington, TX	UA
	Cleveland, TX	Houston, TX	UA
	Denton Southwest, TX	Denton--Lewisville, TX	UA
	Devine, TX	Lytle, TX	UC
	Forney, TX	Dallas--Fort Worth--Arlington, TX	UA
	Grangerland, TX	Houston, TX	UA
	Homesteads Addition, TX	Dallas--Fort Worth--Arlington, TX	UA
	Lake Conroe Eastshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Northshore, TX	Conroe--The Woodlands, TX	UA
	Lake Conroe Westshore, TX	Conroe--The Woodlands, TX	UA
	Lytle, TX	Devine, TX	UC
	Magnolia, TX	Houston, TX	UA
	Manor, TX	Austin, TX	UA
	Odem, TX	Corpus Christi, TX	UA
	Pecan Acres, TX	Dallas--Fort Worth--Arlington, TX	UA
	Rio Hondo, TX	Harlingen, TX	UA
Virginia	Purcellville, VA	Washington, DC--VA--MD	UA
Vermont	Milton, VT	Burlington, VT	UA
Washington	Granite Falls, WA	Marysville, WA	UA

A.3 Scenario 1C (50% & UAs Merge if within 0 miles) – All Mergers Table

State	2010 Urbanized Area	Name of UA Predicted to Merge Into
Arizona	Phoenix--Mesa, AZ	Avondale--Goodyear, AZ
California	Antioch, CA	Concord, CA
	Camarillo, CA	Oxnard, CA
	Concord, CA	San Francisco--Oakland, CA
	Fairfield, CA	Vacaville, CA
	Livermore, CA	Concord, CA
	Los Angeles--Long Beach--Anaheim, CA	Riverside--San Bernardino, CA
	Manteca, CA	Stockton, CA
	Mission Viejo--Lake Forest--San Clemente, CA	Los Angeles--Long Beach--Anaheim, CA
	Modesto, CA	Turlock, CA
	Murrieta--Temecula--Menifee, CA	Riverside--San Bernardino, CA
	Napa, CA	Vallejo, CA
	Oxnard, CA	Camarillo, CA
	Petaluma, CA	Santa Rosa, CA
	Riverside--San Bernardino, CA	Los Angeles--Long Beach--Anaheim, CA
	Salinas, CA	Seaside--Monterey, CA
	San Diego, CA	Mission Viejo--Lake Forest--San Clemente, CA
	San Francisco--Oakland, CA	San Jose, CA
	San Jose, CA	San Francisco--Oakland, CA
	San Luis Obispo, CA	Arroyo Grande--Grover Beach, CA
	Santa Clarita, CA	Los Angeles--Long Beach--Anaheim, CA
	Santa Cruz, CA	Watsonville, CA
	Santa Rosa, CA	Petaluma, CA
	Seaside--Monterey, CA	Salinas, CA
	Simi Valley, CA	Los Angeles--Long Beach--Anaheim, CA
	Stockton, CA	Manteca, CA
	Thousand Oaks, CA	Los Angeles--Long Beach--Anaheim, CA
	Turlock, CA	Modesto, CA
	Vacaville, CA	Fairfield, CA

	Vallejo, CA	Napa, CA
	Watsonville, CA	Santa Cruz, CA
Colorado	Boulder, CO	Longmont, CO
	Fort Collins, CO	Greeley, CO
	Greeley, CO	Fort Collins, CO
	Lafayette--Louisville--Erie, CO	Denver--Aurora, CO
Connecticut	Hartford, CT	Springfield, MA--CT
	New Haven, CT	Hartford, CT
	Waterbury, CT	Hartford, CT
	Bridgeport--Stamford, CT--NY	New York--Newark, NY--NJ--CT
	Danbury, CT--NY	Bridgeport--Stamford, CT--NY
Washington D.C.	Washington, DC--VA--MD	Baltimore, MD
Florida	Bonita Springs, FL	Cape Coral, FL
	Cape Coral, FL	Bonita Springs, FL
	Fort Walton Beach--Navarre--Wright, FL	Pensacola, FL--AL
	Lady Lake--The Villages, FL	Ocala, FL
	Lakeland, FL	Tampa--St. Petersburg, FL
	Leesburg--Eustis--Tavares, FL	Orlando, FL
	Miami, FL	Port St. Lucie, FL
	North Port--Port Charlotte, FL	Sarasota--Bradenton, FL
	Ocala, FL	Lady Lake--The Villages, FL
	Palm Bay--Melbourne, FL	Sebastian--Vero Beach South--Florida Ridge, FL
	Port St. Lucie, FL	Miami, FL
	Sarasota--Bradenton, FL	Tampa--St. Petersburg, FL
	Sebastian--Vero Beach South--Florida Ridge, FL	Palm Bay--Melbourne, FL
	Spring Hill, FL	Tampa--St. Petersburg, FL
	Tampa--St. Petersburg, FL	Sarasota--Bradenton, FL
	Titusville, FL	Palm Bay--Melbourne, FL
	Winter Haven, FL	Lakeland, FL
	Zephyrhills, FL	Tampa--St. Petersburg, FL
	Pensacola, FL--AL	Fort Walton Beach--Navarre--Wright, FL
Georgia	Cartersville, GA	Atlanta, GA
	Dalton, GA	Chattanooga, TN--GA

	Gainesville, GA	Atlanta, GA
	Macon, GA	Warner Robins, GA
	Warner Robins, GA	Macon, GA
Hawaii	Kailua (Honolulu County)--Kaneohe, HI	Urban Honolulu, HI
	Urban Honolulu, HI	Kailua (Honolulu County)--Kaneohe, HI
Idaho	Boise City, ID	Nampa, ID
	Coeur d'Alene, ID	Spokane, WA
	Nampa, ID	Boise City, ID
Illinois	Rockford, IL	Beloit, WI--IL
	Alton, IL--MO	St. Louis, MO--IL
	Round Lake Beach--McHenry--Grayslake, IL--WI	Chicago, IL--IN
Indiana	Elkhart, IN--MI	South Bend, IN--MI
	South Bend, IN--MI	Elkhart, IN--MI
Massachusetts	Leominster--Fitchburg, MA	Boston, MA--NH--RI
	New Bedford, MA	Providence, RI--MA
	Springfield, MA--CT	Hartford, CT
	Worcester, MA--CT	Boston, MA--NH--RI
Maryland	Aberdeen--Bel Air South--Bel Air North, MD	Philadelphia, PA--NJ--DE--MD
	Baltimore, MD	Washington, DC--VA--MD
	Waldorf, MD	Washington, DC--VA--MD
Michigan	Ann Arbor, MI	Detroit, MI
	Bay City, MI	Saginaw, MI
	Detroit, MI	Ann Arbor, MI
	Midland, MI	Saginaw, MI
	Monroe, MI	Detroit, MI
	Saginaw, MI	Bay City, MI
	South Lyon--Howell, MI	Detroit, MI
Missouri	Lee's Summit, MO	Kansas City, MO--KS
	St. Louis, MO--IL	Alton, IL--MO
Mississippi	Gulfport, MS	Pascagoula, MS
North Carolina	Burlington, NC	Durham, NC
	Concord, NC	Charlotte, NC--SC
	Greensboro, NC	Winston-Salem, NC
	High Point, NC	Winston-Salem, NC
	Raleigh, NC	Durham, NC
	Winston-Salem, NC	Greensboro, NC
	Gastonia, NC--SC	Charlotte, NC--SC

New Hampshire	Nashua, NH--MA	Boston, MA--NH--RI
	Portsmouth, NH--ME	Boston, MA--NH--RI
New Jersey	Trenton, NJ	Philadelphia, PA--NJ--DE--MD
	Twin Rivers--Hightstown, NJ	New York--Newark, NY--NJ--CT
	Vineland, NJ	Philadelphia, PA--NJ--DE--MD
Ohio	Akron, OH	Cleveland, OH
	Canton, OH	Akron, OH
	Cleveland, OH	Akron, OH
	Dayton, OH	Middletown, OH
	Lorain--Elyria, OH	Cleveland, OH
	Middletown, OH	Cincinnati, OH--KY--IN
	Cincinnati, OH--KY--IN	Middletown, OH
Oklahoma	Norman, OK	Oklahoma City, OK
	Oklahoma City, OK	Norman, OK
Oregon	Grants Pass, OR	Medford, OR
	Medford, OR	Grants Pass, OR
Pennsylvania	Pittsburgh, PA	Uniontown--Connellsville, PA
	Pottstown, PA	Philadelphia, PA--NJ--DE--MD
	Uniontown--Connellsville, PA	Pittsburgh, PA
Rhode Island	Providence, RI--MA	Boston, MA--NH--RI
South Carolina	Anderson, SC	Greenville, SC
	Greenville, SC	Spartanburg, SC
	Mauldin--Simpsonville, SC	Greenville, SC
	Rock Hill, SC	Charlotte, NC--SC
	Spartanburg, SC	Greenville, SC
Tennessee	Johnson City, TN	Kingsport, TN--VA
	Murfreesboro, TN	Nashville-Davidson, TN
	Nashville-Davidson, TN	Murfreesboro, TN
	Chattanooga, TN--GA	Dalton, GA
	Kingsport, TN--VA	Johnson City, TN
Texas	Beaumont, TX	Port Arthur, TX
	Brownsville, TX	Harlingen, TX
	McAllen, TX	Harlingen, TX
	McKinney, TX	Dallas--Fort Worth--Arlington, TX
	Midland, TX	Odessa, TX
	Odessa, TX	Midland, TX
	Port Arthur, TX	Beaumont, TX
	San Marcos, TX	Austin, TX
	Texas City, TX	Houston, TX

Utah	Ogden--Layton, UT	Salt Lake City--West Valley City, UT
	Provo--Orem, UT	Salt Lake City--West Valley City, UT
	Salt Lake City--West Valley City, UT	Ogden--Layton, UT
Virginia	Virginia Beach, VA	Williamsburg, VA
	Williamsburg, VA	Virginia Beach, VA
Washington	Spokane, WA	Coeur d'Alene, ID
Wisconsin	Janesville, WI	Beloit, WI--IL
	Racine, WI	Kenosha, WI--IL
	Beloit, WI--IL	Rockford, IL
	Kenosha, WI--IL	Chicago, IL--IN
West Virginia	Charleston, WV	Huntington, WV--KY--OH
	Huntington, WV--KY--OH	Charleston, WV

A.4 Scenario 2A (75% & ½ Mile) – All Mergers Table

State	2010 Urban Cluster	Name of UC/UA Predicted to Merge Into	UC/UA LSAD
Alabama	Hazel Green, AL	Huntsville, AL	UA
	Priceville, AL	Decatur, AL	UA
	Robertsdale, AL	Daphne--Fairhope, AL	UA
Arizona	Buckeye, AZ	Avondale--Goodyear, AZ	UA
	Lake of the Woods--Pinetop-Lakeside, AZ	Show Low, AZ	UC
	Nogales, AZ	Rio Rico Northeast, AZ	UC
	Rio Rico Northeast, AZ	Nogales, AZ	UC
	Show Low, AZ	Lake of the Woods--Pinetop-Lakeside, AZ	UC
	Bullhead City, AZ--NV	Laughlin, NV	UC
California	Auburn--North Auburn, CA	Sacramento, CA	UA
	Carmel Valley Village, CA	Seaside--Monterey, CA	UA
	Nipomo, CA	Arroyo Grande--Grover Beach, CA	UA
Colorado	Edwards, CO	Vail, CO	UC
	Firestone--Frederick, CO	Longmont, CO	UA

	Lochbuie, CO	Denver--Aurora, CO	UA
	Vail, CO	Edwards, CO	UC
Connecticut	Jewett City, CT	Worcester, MA--CT	UA
	Willimantic, CT	Hartford, CT	UA
Delaware	Bridgeville, DE	Salisbury, MD--DE	UA
Florida	Crystal River, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Fernandina Beach, FL	Yulee, FL	UC
	Four Corners, FL	Winter Haven, FL	UA
	Golden Gate Estates, FL	Bonita Springs, FL	UA
	Jupiter Farms, FL	Miami, FL	UA
	Panama City Northeast, FL	Panama City, FL	UA
	Poinciana, FL	Kissimmee, FL	UA
	Rainbow Lakes Estates, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Santa Rosa Beach, FL	Fort Walton Beach--Navarre--Wright, FL	UA
	Sugarmill Woods, FL	Homosassa Springs--Beverly Hills--Citrus Springs, FL	UA
	Yulee, FL	Fernandina Beach, FL	UC
Georgia	Monroe, GA	Atlanta, GA	UA
	Winder, GA	Atlanta, GA	UA
Illinois	Lake Holiday, IL	Chicago, IL--IN	UA
	Murphysboro, IL	Carbondale, IL	UA
	Wonder Lake, IL	Round Lake Beach--McHenry--Grayslake, IL--WI	UA
Indiana	Charlestown, IN	Louisville/Jefferson County, KY--IN	UA
	Lowell, IN	Chicago, IL--IN	UA
Kentucky	Nicholasville, KY	Wilmore, KY	UC
	Wilmore, KY	Nicholasville, KY	UC
Louisiana	Donaldsonville, LA	Houma, LA	UA
	Gramercy--Lutcher, LA	New Orleans, LA	UA
Massachusetts	North Brookfield, MA	Worcester, MA--CT	UA
	North Adams, MA--VT	Pittsfield, MA	UA
Maryland	Glenwood, MD	Baltimore, MD	UA
Michigan	Cedar Springs, MI	Grand Rapids, MI	UA
	Sparta, MI	Grand Rapids, MI	UA

Minnesota	Monticello--Big Lake, MN	Minneapolis--St. Paul, MN--WI	UA
Missouri	Platte City, MO	Kansas City, MO--KS	UA
	Smithville North, MO	Kansas City, MO--KS	UA
	Willard, MO	Springfield, MO	UA
Montana	Belgrade, MT	Bozeman, MT	UC
	Bozeman, MT	Belgrade, MT	UC
North Carolina	Lake Norman of Catawba, NC	Charlotte, NC--SC	UA
	Oak Island, NC	St. James, NC	UC
	Pinehurst--Southern Pines, NC	Whispering Pines, NC	UC
	St. James, NC	Oak Island, NC	UC
	Wendell--Zebulon, NC	Raleigh, NC	UA
	Whispering Pines, NC	Pinehurst--Southern Pines, NC	UC
Nebraska	Plattsmouth, NE	Omaha, NE--IA	UA
New Hampshire	Epping, NH	Boston, MA--NH--RI	UA
New Jersey	Newton, NJ	New York--Newark, NY--NJ--CT	UA
New Mexico	Aztec, NM	Farmington, NM	UA
	Kirtland, NM	Farmington, NM	UA
Nevada	Laughlin, NV	Bullhead City, AZ--NV	UC
New York	Bedford, NY	New York--Newark, NY--NJ--CT	UA
	Chester, NY	Poughkeepsie--Newburgh, NY--NJ	UA
	Lockport, NY	Buffalo, NY	UA
	Maybrook, NY	Walden, NY	UC
	Walden, NY	Maybrook, NY	UC
Ohio	Ashtabula, OH	Conneaut, OH	UC
	Conneaut, OH	Ashtabula, OH	UC
	Genoa, OH	Toledo, OH--MI	UA
	Sandusky, OH	Lorain--Elyria, OH	UA
Oklahoma	Collinsville, OK	Tulsa, OK	UA
Pennsylvania	Burgettstown, PA	Pittsburgh, PA	UA
	Fairdale, PA	Masontown, PA	UC
	Jersey Shore, PA	Lock Haven, PA	UC
	Lock Haven, PA	Jersey Shore, PA	UC
	Lykens, PA	Williamstown, PA	UC
	Masontown, PA	Fairdale, PA	UC
	Quarryville, PA	Lancaster, PA	UA

	Roaring Spring, PA	Altoona, PA	UA
	Williamstown, PA	Lykens, PA	UC
South Carolina	Camden, SC	Columbia, SC	UA
	Lake Murray North Shore, SC	Columbia, SC	UA
	Seneca, SC	Greenville, SC	UA
	Sun City Hilton Head, SC	Hilton Head Island, SC	UA
Tennessee	Arlington, TN	Memphis, TN--MS--AR	UA
	Jasper, TN	South Pittsburg, TN--AL	UC
	South Pittsburg, TN--AL	Jasper, TN	UC
Texas	Boerne, TX	San Antonio, TX	UA
	Cleburne, TX	Dallas--Fort Worth--Arlington, TX	UA
	Cleveland, TX	Houston, TX	UA
	Denton Southwest, TX	Denton--Lewisville, TX	UA
	Devine, TX	Lytle, TX	UC
	Granbury, TX	Pecan Plantation, TX	UC
	Hempstead, TX	Prairie View, TX	UC
	Lake Conroe Eastshore, TX	Lake Conroe Westshore, TX	UC
	Lake Conroe Westshore, TX	Lake Conroe Eastshore, TX	UC
	Lytle, TX	Devine, TX	UC
	Manor, TX	Austin, TX	UA
	Paloma Creek South--Paloma Creek, TX	Dallas--Fort Worth--Arlington, TX	UA
	Pecan Plantation, TX	Granbury, TX	UC
	Prairie View, TX	Hempstead, TX	UC
	Rio Hondo, TX	Harlingen, TX	UA
Utah	Park City, UT	Summit Park, UT	UC
	Summit Park, UT	Park City, UT	UC
Virginia	Purcellville, VA	Washington, DC--VA--MD	UA
Washington	Indianola, WA	Bremerton, WA	UA
	Snoqualmie, WA	Seattle, WA	UA
Wisconsin	Burlington, WI	Milwaukee, WI	UA
	Hudson, WI--MN	Minneapolis--St. Paul, MN--WI	UA

A.5 Scenario 2C (75% & UAs merge if within 0 miles) – All Mergers Table

State	2010 Urbanized Area	Name of UA Predicted to Merge Into
Arizona	Avondale--Goodyear, AZ	Phoenix--Mesa, AZ
	Phoenix--Mesa, AZ	Avondale--Goodyear, AZ
California	Concord, CA	Livermore, CA
	Livermore, CA	Concord, CA
	Los Angeles--Long Beach--Anaheim, CA	Mission Viejo--Lake Forest--San Clemente, CA
	Manteca, CA	Stockton, CA
	Mission Viejo--Lake Forest--San Clemente, CA	Los Angeles--Long Beach--Anaheim, CA
	Murrieta--Temecula--Menifee, CA	Riverside--San Bernardino, CA
	Petaluma, CA	Santa Rosa, CA
	Riverside--San Bernardino, CA	Los Angeles--Long Beach--Anaheim, CA
	San Francisco--Oakland, CA	San Jose, CA
	San Jose, CA	San Francisco--Oakland, CA
	Santa Rosa, CA	Petaluma, CA
	Simi Valley, CA	Los Angeles--Long Beach--Anaheim, CA
	Stockton, CA	Manteca, CA
	Thousand Oaks, CA	Simi Valley, CA
Colorado	Denver--Aurora, CO	Lafayette--Louisville--Erie, CO
	Lafayette--Louisville--Erie, CO	Denver--Aurora, CO
Connecticut	Hartford, CT	New Haven, CT
	New Haven, CT	Bridgeport--Stamford, CT--NY
	Waterbury, CT	Hartford, CT
	Bridgeport--Stamford, CT--NY	New York--Newark, NY--NJ--CT
	Danbury, CT--NY	Bridgeport--Stamford, CT--NY
Washington D.C.	Washington, DC--VA--MD	Baltimore, MD
Florida	Bonita Springs, FL	Cape Coral, FL
	Cape Coral, FL	Bonita Springs, FL
	Kissimmee, FL	Orlando, FL
	Orlando, FL	Kissimmee, FL
	Port St. Lucie, FL	Sebastian--Vero Beach South--Florida Ridge, FL

	Sebastian--Vero Beach South--Florida Ridge, FL	Port St. Lucie, FL
	Spring Hill, FL	Tampa--St. Petersburg, FL
	Tampa--St. Petersburg, FL	Spring Hill, FL
	Zephyrhills, FL	Tampa--St. Petersburg, FL
Georgia	Atlanta, GA	Cartersville, GA
	Cartersville, GA	Atlanta, GA
	Gainesville, GA	Atlanta, GA
	Macon, GA	Warner Robins, GA
	Warner Robins, GA	Macon, GA
Hawaii	Kailua (Honolulu County)--Kaneohe, HI	Urban Honolulu, HI
	Urban Honolulu, HI	Kailua (Honolulu County)--Kaneohe, HI
Idaho	Boise City, ID	Nampa, ID
	Coeur d'Alene, ID	Spokane, WA
	Nampa, ID	Boise City, ID
Illinois	Rockford, IL	Beloit, WI--IL
	Chicago, IL--IN	Kenosha, WI--IL
	Alton, IL--MO	St. Louis, MO--IL
	Round Lake Beach--McHenry--Grayslake, IL--WI	Chicago, IL--IN
Indiana	Elkhart, IN--MI	South Bend, IN--MI
	South Bend, IN--MI	Elkhart, IN--MI
Massachusetts	New Bedford, MA	Providence, RI--MA
	Springfield, MA--CT	Hartford, CT
	Worcester, MA--CT	Boston, MA--NH--RI
	Boston, MA--NH--RI	Nashua, NH--MA
Maryland	Baltimore, MD	Washington, DC--VA--MD
	Waldorf, MD	Washington, DC--VA--MD
Michigan	Ann Arbor, MI	Detroit, MI
	Detroit, MI	Ann Arbor, MI
	Monroe, MI	Detroit, MI
	South Lyon--Howell, MI	Detroit, MI
Missouri	Lee's Summit, MO	Kansas City, MO--KS
	St. Louis, MO--IL	Alton, IL--MO
	Kansas City, MO--KS	Lee's Summit, MO
North Carolina	Concord, NC	Charlotte, NC--SC
	Durham, NC	Raleigh, NC
	Greensboro, NC	High Point, NC
	High Point, NC	Greensboro, NC

	Raleigh, NC	Durham, NC
	Winston-Salem, NC	High Point, NC
	Charlotte, NC--SC	Concord, NC
New Hampshire	Manchester, NH	Nashua, NH--MA
	Nashua, NH--MA	Boston, MA--NH--RI
	Portsmouth, NH--ME	Boston, MA--NH--RI
New Jersey	Trenton, NJ	Twin Rivers--Hightstown, NJ
	Twin Rivers--Hightstown, NJ	New York--Newark, NY--NJ--CT
	Vineland, NJ	Philadelphia, PA--NJ--DE--MD
New York	New York--Newark, NY--NJ--CT	Twin Rivers--Hightstown, NJ
Ohio	Akron, OH	Canton, OH
	Canton, OH	Akron, OH
	Cleveland, OH	Akron, OH
	Dayton, OH	Middletown, OH
	Lorain--Elyria, OH	Cleveland, OH
	Middletown, OH	Cincinnati, OH--KY--IN
	Cincinnati, OH--KY--IN	Middletown, OH
Oklahoma	Norman, OK	Oklahoma City, OK
	Oklahoma City, OK	Norman, OK
Pennsylvania	Pittsburgh, PA	Uniontown--Connellsville, PA
	Pottstown, PA	Philadelphia, PA--NJ--DE--MD
	Uniontown--Connellsville, PA	Pittsburgh, PA
	Philadelphia, PA--NJ--DE--MD	Trenton, NJ
Rhode Island	Providence, RI--MA	Boston, MA--NH--RI
South Carolina	Greenville, SC	Mauldin--Simpsonville, SC
	Mauldin--Simpsonville, SC	Greenville, SC
	Spartanburg, SC	Greenville, SC
Tennessee	Johnson City, TN	Kingsport, TN--VA
	Kingsport, TN--VA	Johnson City, TN
Texas	Beaumont, TX	Port Arthur, TX
	Conroe--The Woodlands, TX	Houston, TX
	Dallas--Fort Worth--Arlington, TX	Denton--Lewisville, TX
	Denton--Lewisville, TX	Dallas--Fort Worth--Arlington, TX
	Houston, TX	Conroe--The Woodlands, TX
	McKinney, TX	Dallas--Fort Worth--Arlington, TX
	Midland, TX	Odessa, TX

	Odessa, TX	Midland, TX
	Port Arthur, TX	Beaumont, TX
	Texas City, TX	Houston, TX
Utah	Ogden--Layton, UT	Salt Lake City--West Valley City, UT
	Salt Lake City--West Valley City, UT	Ogden--Layton, UT
Washington	Spokane, WA	Coeur d'Alene, ID
Wisconsin	Racine, WI	Kenosha, WI--IL
	Beloit, WI--IL	Rockford, IL
	Kenosha, WI--IL	Chicago, IL--IN
West Virginia	Huntington, WV--KY--OH	Charleston, WV

A.6 Scenario 1A (50% & ½ Mile) – § 5311 Apportionment Quotient Changes (2010 – 2020)

State	National Population Share 2010	National Land Area Share 2010	Total 5311 Apportio-nment 2010	National Population Share 2020	National Land Area Share 2020	Total 5311 Apportio-nment 2020	Percent Change (2010-2020)
AK	0.44%	16.56%	3.67%	0.43%	7.42%	1.83%	-1.84%
AL	2.76%	1.42%	2.49%	2.74%	1.51%	2.49%	0.00%
AR	1.98%	1.49%	1.89%	2.10%	1.60%	2.00%	0.11%
AS	1.43%	3.24%	1.80%	1.46%	3.49%	1.87%	0.07%
AZ	0.06%	0.00%	0.05%	1.19%	3.46%	1.64%	1.59%
CA	4.14%	4.31%	4.18%	4.17%	4.60%	4.25%	0.08%
CO	1.31%	2.97%	1.64%	1.31%	3.19%	1.68%	0.04%
CT	0.61%	0.09%	0.51%	0.55%	0.09%	0.46%	-0.05%
DC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DE	0.32%	0.05%	0.26%	0.27%	0.05%	0.23%	-0.04%
FL	2.66%	1.36%	2.40%	2.26%	1.39%	2.08%	-0.32%
GA	3.78%	1.55%	3.33%	3.62%	1.64%	3.23%	-0.10%

GU	0.18%	0.01%	0.14%	0.18%	0.01%	0.15%	0.00%
HI	0.44%	0.18%	0.39%	0.43%	0.19%	0.38%	0.00%
IA	2.00%	1.60%	1.92%	2.04%	1.72%	1.97%	0.05%
ID	0.87%	2.39%	1.18%	0.86%	2.53%	1.19%	0.02%
IL	2.89%	1.51%	2.62%	2.81%	1.60%	2.57%	-0.05%
IN	2.98%	0.98%	2.58%	2.95%	1.04%	2.57%	-0.01%
KS	1.60%	2.35%	1.75%	1.64%	2.53%	1.82%	0.07%
KY	2.88%	1.12%	2.53%	2.95%	1.20%	2.60%	0.07%
LA	1.97%	1.21%	1.82%	1.93%	1.29%	1.80%	-0.02%
MA	0.71%	0.14%	0.60%	0.66%	0.15%	0.56%	-0.04%
MD	1.07%	0.23%	0.90%	1.06%	0.24%	0.89%	-0.01%
ME	1.10%	0.89%	1.06%	1.16%	0.95%	1.12%	0.06%
MI	3.74%	1.55%	3.30%	3.62%	1.66%	3.23%	-0.08%
MN	2.51%	2.28%	2.46%	2.52%	2.44%	2.51%	0.04%
MO	2.93%	1.95%	2.73%	2.97%	2.08%	2.79%	0.06%
MP	0.06%	0.01%	0.05%	0.06%	0.01%	0.05%	0.00%
MS	2.42%	1.34%	2.20%	2.43%	1.44%	2.23%	0.03%
MT	0.82%	4.22%	1.50%	0.77%	4.54%	1.52%	0.03%
NC	4.84%	1.31%	4.14%	4.64%	1.37%	3.99%	-0.15%
ND	0.45%	2.00%	0.76%	0.50%	2.15%	0.83%	0.07%
NE	0.95%	2.22%	1.20%	0.96%	2.38%	1.25%	0.04%
NH	0.78%	0.24%	0.67%	0.74%	0.26%	0.64%	-0.03%
NJ	0.77%	0.13%	0.64%	0.72%	0.14%	0.60%	-0.04%
NM	1.07%	3.51%	1.56%	0.99%	3.77%	1.54%	-0.02%
NV	0.34%	3.17%	0.90%	0.44%	3.40%	1.04%	0.13%
NY	3.78%	1.27%	3.28%	3.73%	1.36%	3.26%	-0.02%
OH	4.51%	1.08%	3.82%	4.43%	1.15%	3.77%	-0.05%

OK	2.29%	1.97%	2.22%	2.27%	2.11%	2.24%	0.01%
OR	1.62%	2.76%	1.85%	1.68%	2.97%	1.94%	0.09%
PA	4.19%	1.18%	3.59%	4.14%	1.27%	3.57%	-0.02%
PR	0.39%	0.05%	0.32%	0.40%	0.06%	0.33%	0.01%
RI	0.11%	0.02%	0.09%	0.11%	0.02%	0.09%	0.00%
SC	2.30%	0.82%	2.01%	2.08%	0.85%	1.83%	-0.17%
SD	0.64%	2.20%	0.95%	0.68%	2.36%	1.02%	0.06%
TN	3.26%	1.13%	2.83%	3.26%	1.20%	2.85%	0.01%
TX	6.92%	7.37%	7.01%	6.76%	7.82%	6.98%	-0.03%
UT	0.59%	2.36%	0.94%	0.64%	2.51%	1.01%	0.07%
VA	2.72%	1.08%	2.39%	2.82%	1.15%	2.49%	0.09%
VI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VT	0.58%	0.27%	0.52%	0.60%	0.29%	0.54%	0.02%
WA	1.89%	1.87%	1.89%	1.92%	2.01%	1.94%	0.05%
WI	2.83%	1.53%	2.57%	2.77%	1.64%	2.55%	-0.02%
WV	1.39%	0.69%	1.25%	1.46%	0.74%	1.31%	0.06%
WY	0.48%	2.82%	0.95%	0.53%	3.03%	1.03%	0.08%

A.7 Scenario 1B (50% & 0 Miles) – § 5311 Apportionment Quotient Changes (2010 – 2020)

State	National Population Share 2010	National Land Area Share 2010	Total 5311 Apportio-nment 2010	National Population Share 2020	National Land Area Share 2020	Total 5311 Apportio-nment 2020	Percent Change (2010-2020)
AK	0.44%	16.56%	3.67%	0.42%	7.41%	1.82%	-1.85%
AL	2.76%	1.42%	2.49%	2.70%	1.51%	2.47%	-0.03%

AR	1.98%	1.49%	1.89%	2.04%	1.60%	1.96%	0.07%
AS	1.43%	3.24%	1.80%	1.43%	3.49%	1.84%	0.04%
AZ	0.06%	0.00%	0.05%	1.20%	3.46%	1.65%	1.60%
CA	4.14%	4.31%	4.18%	4.16%	4.60%	4.25%	0.07%
CO	1.31%	2.97%	1.64%	1.28%	3.18%	1.66%	0.02%
CT	0.61%	0.09%	0.51%	1.59%	0.11%	1.29%	0.79%
DC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DE	0.32%	0.05%	0.26%	0.26%	0.05%	0.22%	-0.04%
FL	2.66%	1.36%	2.40%	2.24%	1.39%	2.07%	-0.33%
GA	3.78%	1.55%	3.33%	3.56%	1.64%	3.18%	-0.15%
GU	0.18%	0.01%	0.14%	0.18%	0.01%	0.14%	0.00%
HI	0.44%	0.18%	0.39%	0.42%	0.19%	0.37%	-0.01%
IA	2.00%	1.60%	1.92%	1.98%	1.72%	1.93%	0.01%
ID	0.87%	2.39%	1.18%	0.85%	2.52%	1.18%	0.01%
IL	2.89%	1.51%	2.62%	2.75%	1.60%	2.52%	-0.10%
IN	2.98%	0.98%	2.58%	2.89%	1.04%	2.52%	-0.06%
KS	1.60%	2.35%	1.75%	1.60%	2.53%	1.79%	0.04%
KY	2.88%	1.12%	2.53%	2.87%	1.20%	2.54%	0.01%
LA	1.97%	1.21%	1.82%	1.92%	1.28%	1.79%	-0.03%
MA	0.71%	0.14%	0.60%	0.67%	0.15%	0.57%	-0.03%
MD	1.07%	0.23%	0.90%	1.05%	0.24%	0.88%	-0.02%
ME	1.10%	0.89%	1.06%	1.13%	0.95%	1.09%	0.03%
MI	3.74%	1.55%	3.30%	3.55%	1.66%	3.17%	-0.14%
MN	2.51%	2.28%	2.46%	2.47%	2.44%	2.46%	0.00%
MO	2.93%	1.95%	2.73%	2.91%	2.08%	2.75%	0.02%
MS	2.42%	1.34%	2.20%	2.37%	1.43%	2.18%	-0.02%
MT	0.82%	4.22%	1.50%	0.75%	4.54%	1.51%	0.01%

NC	4.84%	1.31%	4.14%	4.61%	1.37%	3.96%	-0.18%
ND	0.45%	2.00%	0.76%	0.49%	2.15%	0.82%	0.06%
NE	0.95%	2.22%	1.20%	0.95%	2.38%	1.23%	0.03%
NH	0.78%	0.24%	0.67%	0.72%	0.26%	0.63%	-0.05%
NJ	0.77%	0.13%	0.64%	0.70%	0.14%	0.59%	-0.05%
NM	1.07%	3.51%	1.56%	0.98%	3.77%	1.54%	-0.02%
NP	0.06%	0.01%	0.05%	0.06%	0.01%	0.05%	0.00%
NV	0.34%	3.17%	0.90%	0.43%	3.40%	1.03%	0.12%
NY	3.78%	1.27%	3.28%	3.76%	1.36%	3.28%	0.00%
OH	4.51%	1.08%	3.82%	4.37%	1.15%	3.73%	-0.09%
OK	2.29%	1.97%	2.22%	2.26%	2.11%	2.23%	0.00%
OR	1.62%	2.76%	1.85%	1.64%	2.97%	1.91%	0.06%
PA	4.19%	1.18%	3.59%	4.05%	1.27%	3.49%	-0.10%
PR	0.39%	0.05%	0.32%	0.39%	0.06%	0.32%	0.00%
RI	0.11%	0.02%	0.09%	0.11%	0.02%	0.09%	0.00%
SC	2.30%	0.82%	2.01%	2.10%	0.85%	1.85%	-0.15%
SD	0.64%	2.20%	0.95%	0.66%	2.36%	1.00%	0.05%
TN	3.26%	1.13%	2.83%	3.21%	1.20%	2.81%	-0.03%
TX	6.92%	7.37%	7.01%	6.68%	7.82%	6.91%	-0.10%
UT	0.59%	2.36%	0.94%	0.64%	2.51%	1.01%	0.07%
VA	2.72%	1.08%	2.39%	2.75%	1.15%	2.43%	0.04%
VI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VT	0.58%	0.27%	0.52%	0.58%	0.29%	0.52%	0.01%
WA	1.89%	1.87%	1.89%	1.91%	2.01%	1.93%	0.04%
WI	2.83%	1.53%	2.57%	2.79%	1.64%	2.56%	-0.01%
WV	1.39%	0.69%	1.25%	1.42%	0.74%	1.28%	0.03%
WY	0.48%	2.82%	0.95%	0.52%	3.03%	1.02%	0.07%

A.8 Scenario 2A (75% & ½ Mile) – § 5311 Apportionment Quotient Changes (2010 – 2020)

State	National Population Share 2010	National Land Area Share 2010	Total 5311 Apportio-nment 2010	National Population Share 2020	National Land Area Share 2020	Total 5311 Apportio-nment 2020	Percent Change (2010-2020)
AK	0.44%	16.56%	3.67%	0.42%	7.37%	1.81%	-1.86%
AL	2.76%	1.42%	2.49%	2.75%	1.52%	2.50%	0.01%
AR	1.98%	1.49%	1.89%	2.02%	1.59%	1.93%	0.05%
AS	1.43%	3.24%	1.80%	1.40%	3.47%	1.81%	0.01%
AZ	0.06%	0.00%	0.05%	1.34%	3.47%	1.76%	1.71%
CA	4.14%	4.31%	4.18%	4.16%	4.61%	4.25%	0.07%
CO	1.31%	2.97%	1.64%	1.28%	3.18%	1.66%	0.02%
CT	0.61%	0.09%	0.51%	0.55%	0.10%	0.46%	-0.05%
DC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DE	0.32%	0.05%	0.26%	0.34%	0.05%	0.28%	0.02%
FL	2.66%	1.36%	2.40%	2.43%	1.44%	2.23%	-0.16%
GA	3.78%	1.55%	3.33%	3.62%	1.66%	3.23%	-0.10%
GU	0.18%	0.01%	0.14%	0.17%	0.01%	0.14%	0.00%
HI	0.44%	0.18%	0.39%	0.46%	0.19%	0.41%	0.02%
IA	2.00%	1.60%	1.92%	1.97%	1.71%	1.92%	0.00%
ID	0.87%	2.39%	1.18%	0.84%	2.51%	1.17%	0.00%
IL	2.89%	1.51%	2.62%	2.80%	1.62%	2.56%	-0.06%
IN	2.98%	0.98%	2.58%	2.87%	1.05%	2.50%	-0.08%
KS	1.60%	2.35%	1.75%	1.59%	2.52%	1.77%	0.02%
KY	2.88%	1.12%	2.53%	2.85%	1.20%	2.52%	-0.01%
LA	1.97%	1.21%	1.82%	1.96%	1.29%	1.83%	0.00%
MA	0.71%	0.14%	0.60%	0.66%	0.15%	0.56%	-0.04%

MD	1.07%	0.23%	0.90%	1.07%	0.24%	0.90%	0.00%
ME	1.10%	0.89%	1.06%	1.12%	0.95%	1.09%	0.03%
MI	3.74%	1.55%	3.30%	3.55%	1.66%	3.17%	-0.13%
MN	2.51%	2.28%	2.46%	2.45%	2.43%	2.45%	-0.01%
MO	2.93%	1.95%	2.73%	2.89%	2.09%	2.73%	0.00%
MS	2.42%	1.34%	2.20%	2.38%	1.44%	2.19%	-0.01%
MT	0.82%	4.22%	1.50%	0.81%	4.51%	1.55%	0.05%
NC	4.84%	1.31%	4.14%	4.77%	1.39%	4.09%	-0.04%
ND	0.45%	2.00%	0.76%	0.49%	2.14%	0.82%	0.06%
NE	0.95%	2.22%	1.20%	0.93%	2.37%	1.22%	0.01%
NH	0.78%	0.24%	0.67%	0.78%	0.26%	0.68%	0.00%
NJ	0.77%	0.13%	0.64%	0.70%	0.14%	0.59%	-0.05%
NM	1.07%	3.51%	1.56%	1.06%	3.75%	1.60%	0.04%
NP	0.06%	0.01%	0.05%	0.06%	0.01%	0.05%	0.00%
NV	0.34%	3.17%	0.90%	0.44%	3.39%	1.03%	0.12%
NY	3.78%	1.27%	3.28%	3.63%	1.35%	3.17%	-0.10%
OH	4.51%	1.08%	3.82%	4.30%	1.15%	3.67%	-0.15%
OK	2.29%	1.97%	2.22%	2.35%	2.10%	2.30%	0.08%
OR	1.62%	2.76%	1.85%	1.64%	2.96%	1.90%	0.05%
PA	4.19%	1.18%	3.59%	4.02%	1.26%	3.47%	-0.12%
PR	0.39%	0.05%	0.32%	0.38%	0.06%	0.31%	-0.01%
RI	0.11%	0.02%	0.09%	0.11%	0.02%	0.09%	0.00%
SC	2.30%	0.82%	2.01%	2.12%	0.87%	1.87%	-0.13%
SD	0.64%	2.20%	0.95%	0.67%	2.35%	1.01%	0.05%
TN	3.26%	1.13%	2.83%	3.28%	1.21%	2.87%	0.03%
TX	6.92%	7.37%	7.01%	7.04%	7.87%	7.20%	0.20%
UT	0.59%	2.36%	0.94%	0.64%	2.50%	1.01%	0.07%

VA	2.72%	1.08%	2.39%	2.77%	1.15%	2.44%	0.05%
VI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VT	0.58%	0.27%	0.52%	0.58%	0.28%	0.52%	0.00%
WA	1.89%	1.87%	1.89%	1.88%	2.00%	1.91%	0.02%
WI	2.83%	1.53%	2.57%	2.72%	1.64%	2.50%	-0.07%
WV	1.39%	0.69%	1.25%	1.41%	0.73%	1.27%	0.02%
WY	0.48%	2.82%	0.95%	0.51%	3.01%	1.01%	0.06%

A.9 Scenario 2B (75% & 0 Miles) – § 5311 Apportionment Quotient Changes (2010 – 2020)

State	National Population Share 2010	National Land Area Share 2010	Total 5311 Apporti-onment 2010	National Population Share 2020	National Land Area Share 2020	Total 5311 Apportio-nment 2020	Percent Change (2010-2020)
AK	0.44%	16.55%	3.66%	0.41%	7.37%	1.80%	-1.86%
AL	2.75%	1.42%	2.49%	2.74%	1.52%	2.49%	0.01%
AR	1.98%	1.49%	1.88%	2.00%	1.59%	1.92%	0.04%
AS	1.43%	3.24%	1.79%	1.43%	3.24%	1.79%	0.00%
AZ	0.06%	0.00%	0.05%	1.35%	3.47%	1.78%	1.73%
CA	4.13%	4.31%	4.16%	4.19%	4.61%	4.27%	0.11%
CO	1.31%	2.97%	1.64%	1.31%	3.18%	1.69%	0.05%
CT	0.61%	0.09%	0.50%	0.55%	0.10%	0.46%	-0.04%
DC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DE	0.32%	0.05%	0.26%	0.34%	0.05%	0.28%	0.02%
FL	2.65%	1.36%	2.39%	2.45%	1.45%	2.25%	-0.14%
GA	3.76%	1.55%	3.32%	3.61%	1.66%	3.22%	-0.10%

GU	0.18%	0.01%	0.14%	0.18%	0.01%	0.14%	0.00%
HI	0.44%	0.18%	0.38%	0.46%	0.19%	0.40%	0.02%
IA	1.99%	1.60%	1.92%	1.95%	1.71%	1.91%	-0.01%
ID	0.87%	2.39%	1.17%	0.83%	2.51%	1.17%	0.00%
IL	2.88%	1.51%	2.61%	2.80%	1.62%	2.56%	-0.05%
IN	2.97%	0.98%	2.57%	2.86%	1.05%	2.50%	-0.07%
KS	1.59%	2.35%	1.75%	1.57%	2.52%	1.76%	0.02%
KY	2.87%	1.12%	2.52%	2.82%	1.20%	2.50%	-0.02%
LA	1.97%	1.21%	1.81%	1.96%	1.29%	1.83%	0.01%
MA	0.71%	0.14%	0.60%	0.68%	0.15%	0.58%	-0.02%
MD	1.07%	0.23%	0.90%	1.06%	0.24%	0.90%	0.00%
ME	1.10%	0.89%	1.06%	1.11%	0.95%	1.08%	0.02%
MI	3.73%	1.55%	3.29%	3.53%	1.66%	3.15%	-0.14%
MN	2.50%	2.27%	2.45%	2.47%	2.43%	2.46%	0.01%
MO	2.91%	1.95%	2.72%	2.89%	2.09%	2.73%	0.01%
MS	2.41%	1.34%	2.20%	2.36%	1.44%	2.17%	-0.02%
MT	0.82%	4.22%	1.50%	0.80%	4.51%	1.54%	0.05%
NC	4.83%	1.31%	4.12%	4.75%	1.39%	4.08%	-0.04%
ND	0.45%	2.00%	0.76%	0.49%	2.14%	0.82%	0.06%
NE	0.95%	2.22%	1.20%	0.93%	2.37%	1.22%	0.02%
NH	0.78%	0.24%	0.67%	0.78%	0.26%	0.68%	0.01%
NJ	0.76%	0.13%	0.64%	0.70%	0.14%	0.58%	-0.05%
NM	1.07%	3.50%	1.56%	1.07%	3.75%	1.60%	0.05%
NP	0.06%	0.01%	0.05%	0.06%	0.01%	0.05%	0.00%
NV	0.34%	3.17%	0.90%	0.43%	3.39%	1.02%	0.12%
NY	3.77%	1.27%	3.27%	3.65%	1.35%	3.19%	-0.08%
OH	4.49%	1.08%	3.81%	4.32%	1.16%	3.69%	-0.12%

OK	2.28%	1.97%	2.22%	2.34%	2.10%	2.29%	0.07%
OR	1.61%	2.76%	1.84%	1.62%	2.96%	1.89%	0.05%
PA	4.18%	1.18%	3.58%	4.00%	1.26%	3.45%	-0.12%
PR	0.39%	0.05%	0.32%	0.39%	0.05%	0.32%	0.00%
RI	0.11%	0.02%	0.09%	0.11%	0.02%	0.09%	0.00%
SC	2.29%	0.82%	2.00%	2.17%	0.87%	1.91%	-0.09%
SD	0.64%	2.20%	0.95%	0.67%	2.35%	1.00%	0.05%
TN	3.25%	1.13%	2.82%	3.27%	1.21%	2.86%	0.04%
TX	6.89%	7.37%	6.98%	7.09%	7.87%	7.24%	0.26%
UT	0.58%	2.36%	0.94%	0.63%	2.50%	1.00%	0.06%
VA	2.71%	1.08%	2.38%	2.74%	1.15%	2.42%	0.04%
VI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VT	0.58%	0.27%	0.52%	0.58%	0.28%	0.52%	0.00%
WA	1.89%	1.87%	1.88%	1.91%	2.00%	1.92%	0.04%
WI	2.82%	1.53%	2.56%	2.75%	1.64%	2.52%	-0.04%
WV	1.39%	0.69%	1.25%	1.40%	0.73%	1.27%	0.02%
WY	0.48%	2.81%	0.94%	0.50%	3.01%	1.00%	0.06%

A.10 Scenario 1A (50% & ½ Mile) – Percent Change in Urbanized Population and Land Area (2010 – 2020)

State	% Urbanized Population 2010	% Urbanized Population 2020	% Change in Urbanized Population (2010-2020)	% Urbanized Land Area 2010	% Urbanized Land Area 2020	% Change in Urbanized Land Area (2010-2020)
AK	44.5%	51.6%	7.1%	0.1%	0.1%	0.0%

AL	48.6%	52.8%	4.1%	3.4%	4.6%	1.3%
AR	39.5%	41.4%	1.9%	1.4%	1.5%	0.1%
AZ	80.1%	85.4%	5.4%	1.6%	2.6%	1.0%
CA	89.7%	90.9%	1.2%	4.7%	5.5%	0.8%
CO	76.9%	79.8%	2.9%	1.2%	1.6%	0.4%
CT	84.8%	86.9%	2.0%	35.9%	37.4%	1.5%
DE	68.7%	76.0%	7.3%	14.7%	20.8%	6.1%
FL	87.4%	90.5%	3.0%	12.7%	17.1%	4.4%
GA	65.4%	70.0%	4.6%	6.9%	8.6%	1.8%
HI	71.5%	74.5%	3.0%	3.5%	5.7%	2.2%
IA	41.7%	45.0%	3.3%	1.0%	1.6%	0.5%
ID	50.5%	56.8%	6.3%	0.4%	0.6%	0.2%
IL	80.0%	81.2%	1.3%	6.0%	7.7%	1.8%
IN	59.2%	62.1%	2.9%	5.6%	7.0%	1.4%
KS	50.2%	52.2%	2.1%	0.8%	1.1%	0.3%
KY	41.0%	43.6%	2.6%	2.2%	2.9%	0.8%
LA	61.3%	65.9%	4.5%	3.6%	4.8%	1.2%
MA	90.3%	91.6%	1.3%	37.1%	38.8%	1.7%
MD	83.5%	85.1%	1.6%	19.0%	21.2%	2.3%
ME	26.2%	27.2%	1.0%	0.8%	1.0%	0.3%
MI	66.4%	68.3%	1.9%	5.4%	6.3%	0.9%
MN	58.0%	60.9%	2.9%	1.5%	2.1%	0.5%
MO	56.6%	58.4%	1.8%	2.2%	3.0%	0.8%
MS	27.6%	31.7%	4.0%	1.3%	2.1%	0.8%

MT	26.5%	37.5%	11.0%	0.1%	0.1%	0.1%
NC	54.9%	61.8%	6.9%	7.4%	9.7%	2.3%
ND	40.0%	48.3%	8.3%	0.2%	0.3%	0.2%
NE	53.8%	57.3%	3.5%	0.5%	0.7%	0.3%
NH	47.3%	53.3%	6.0%	5.8%	7.6%	1.8%
NJ	92.2%	93.1%	0.9%	37.7%	38.4%	0.7%
NM	53.7%	60.1%	6.4%	0.4%	0.5%	0.1%
NV	86.5%	87.3%	0.8%	0.6%	0.8%	0.2%
NY	82.7%	83.8%	1.2%	7.4%	7.7%	0.2%
OH	65.3%	67.1%	1.8%	8.8%	10.0%	1.2%
OK	45.8%	52.0%	6.2%	1.2%	1.8%	0.5%
OR	62.5%	64.3%	1.8%	0.8%	1.0%	0.2%
PA	70.7%	72.2%	1.5%	9.0%	9.3%	0.3%
RI	90.5%	91.0%	0.5%	38.4%	40.3%	1.9%
SC	55.8%	64.4%	8.6%	6.5%	9.2%	2.8%
SD	29.9%	34.7%	4.7%	0.1%	0.3%	0.1%
TN	54.4%	58.6%	4.2%	5.3%	6.6%	1.3%
TX	75.4%	79.7%	4.4%	2.8%	4.2%	1.4%
UT	81.2%	82.5%	1.3%	0.9%	1.2%	0.2%
VA	69.8%	71.9%	2.2%	5.8%	6.8%	1.0%
VT	17.4%	19.8%	2.4%	0.7%	0.8%	0.2%
WA	75.0%	77.3%	2.3%	3.0%	3.4%	0.4%
WI	55.8%	58.6%	2.8%	2.6%	3.4%	0.8%
WV	33.2%	34.7%	1.5%	1.8%	1.9%	0.1%

WY	24.5%	26.1%	1.5%	0.1%	0.1%	0.0%

A.11 Scenario 1B (50% & 0 Miles) – Percent Change in Urbanized Population and Land Area (2010 – 2020)

State	% Urbanized Population 2010	% Urbanized Population 2020	% Change in Urbanized Population (2010-2020)	% Urbanized Land Area 2010	% Urbanized Land Area 2020	% Change in Urbanized Land Area (2010-2020)
AK	44.5%	51.6%	7.1%	0.1%	0.1%	0.0%
AL	48.6%	52.1%	3.5%	3.4%	4.6%	1.2%
AR	39.5%	41.4%	1.9%	1.4%	1.5%	0.1%
AZ	80.1%	84.9%	4.9%	1.6%	2.6%	1.0%
CA	89.7%	90.7%	0.9%	4.7%	5.4%	0.7%
CO	76.9%	79.8%	2.9%	1.2%	1.6%	0.4%
CT	84.8%	61.2%	-23.7%	35.9%	27.7%	-8.2%
DE	68.7%	76.0%	7.3%	14.7%	20.8%	6.1%
FL	87.4%	90.3%	2.9%	12.7%	17.0%	4.3%
GA	65.4%	69.7%	4.3%	6.9%	8.6%	1.7%
HI	71.5%	74.5%	3.0%	3.5%	5.7%	2.2%
IA	41.7%	45.0%	3.3%	1.0%	1.6%	0.5%
ID	50.5%	56.4%	5.8%	0.4%	0.6%	0.2%
IL	80.0%	81.2%	1.2%	6.0%	7.7%	1.7%
IN	59.2%	62.0%	2.8%	5.6%	6.9%	1.4%

KS	50.2%	52.2%	2.1%	0.8%	1.1%	0.3%
KY	41.0%	43.6%	2.6%	2.2%	2.9%	0.8%
LA	61.3%	65.2%	3.8%	3.6%	4.8%	1.2%
MA	90.3%	91.3%	1.0%	37.1%	38.5%	1.4%
MD	83.5%	84.8%	1.3%	19.0%	21.1%	2.1%
ME	26.2%	27.2%	1.0%	0.8%	1.0%	0.3%
MI	66.4%	68.1%	1.7%	5.4%	6.2%	0.9%
MN	58.0%	60.7%	2.7%	1.5%	2.0%	0.5%
MO	56.6%	58.1%	1.5%	2.2%	2.9%	0.7%
MS	27.6%	31.7%	4.0%	1.3%	2.1%	0.8%
MT	26.5%	37.5%	11.0%	0.1%	0.1%	0.1%
NC	54.9%	61.1%	6.2%	7.4%	9.6%	2.2%
ND	40.0%	48.3%	8.3%	0.2%	0.3%	0.2%
NE	53.8%	56.9%	3.2%	0.5%	0.7%	0.3%
NH	47.3%	53.3%	6.0%	5.8%	7.6%	1.8%
NJ	92.2%	93.1%	0.9%	37.7%	38.4%	0.7%
NM	53.7%	59.3%	5.5%	0.4%	0.5%	0.1%
NV	86.5%	87.3%	0.8%	0.6%	0.8%	0.2%
NY	82.7%	83.3%	0.6%	7.4%	7.5%	0.1%
OH	65.3%	66.7%	1.4%	8.8%	9.9%	1.1%
OK	45.8%	51.1%	5.3%	1.2%	1.7%	0.5%
OR	62.5%	64.2%	1.7%	0.8%	1.0%	0.2%
PA	70.7%	72.1%	1.5%	9.0%	9.3%	0.3%
RI	90.5%	91.0%	0.5%	38.4%	40.3%	1.9%

SC	55.8%	63.0%	7.2%	6.5%	9.0%	2.5%
SD	29.9%	34.7%	4.7%	0.1%	0.3%	0.1%
TN	54.4%	58.2%	3.8%	5.3%	6.6%	1.2%
TX	75.4%	79.5%	4.1%	2.8%	4.2%	1.4%
UT	81.2%	82.1%	0.9%	0.9%	1.2%	0.2%
VA	69.8%	71.9%	2.2%	5.8%	6.8%	1.0%
VT	17.4%	19.7%	2.4%	0.7%	0.8%	0.2%
WA	75.0%	76.8%	1.8%	3.0%	3.3%	0.4%
WI	55.8%	57.3%	1.5%	2.6%	3.3%	0.7%
WV	33.2%	34.7%	1.5%	1.8%	1.9%	0.1%
WY	24.5%	26.1%	1.5%	0.1%	0.1%	0.0%

A.12 Scenario 2A (75% & ½ Mile) – Percent Change in Urbanized Population and Land Area (2010 – 2020)

State	% Urbanized Population 2010	% Urbanized Population 2020	% Change in Urbanized Population (2010-2020)	% Urbanized Land Area 2010	% Urbanized Land Area 2020	% Change in Urbanized Land Area (2010-2020)
AK	44.5%	51.0%	6.5%	0.1%	0.1%	0.0%
AL	48.6%	50.4%	1.8%	3.4%	3.5%	0.1%
AR	39.5%	40.9%	1.4%	1.4%	1.4%	0.0%
AZ	80.1%	82.8%	2.8%	1.6%	1.7%	0.1%
CA	89.7%	90.5%	0.7%	4.7%	4.8%	0.1%

CO	76.9%	79.3%	2.4%	1.2%	1.3%	0.0%
CT	84.8%	86.4%	1.6%	35.9%	36.8%	0.9%
DE	68.7%	68.5%	-0.3%	14.7%	15.3%	0.6%
FL	87.4%	89.3%	1.8%	12.7%	13.3%	0.5%
GA	65.4%	68.5%	3.2%	6.9%	7.3%	0.4%
HI	71.5%	71.3%	-0.1%	3.5%	3.6%	0.1%
IA	41.7%	44.2%	2.6%	1.0%	1.1%	0.1%
ID	50.5%	55.9%	5.4%	0.4%	0.4%	0.0%
IL	80.0%	80.4%	0.5%	6.0%	6.0%	0.0%
IN	59.2%	61.5%	2.3%	5.6%	5.7%	0.1%
KS	50.2%	51.7%	1.5%	0.8%	0.8%	0.0%
KY	41.0%	43.0%	2.0%	2.2%	2.3%	0.2%
LA	61.3%	63.6%	2.3%	3.6%	3.8%	0.2%
MA	90.3%	91.2%	0.9%	37.1%	37.8%	0.7%
MD	83.5%	84.2%	0.7%	19.0%	19.2%	0.3%
ME	26.2%	26.0%	-0.2%	0.8%	0.8%	0.0%
MI	66.4%	67.4%	1.1%	5.4%	5.5%	0.2%
MN	58.0%	60.2%	2.2%	1.5%	1.7%	0.1%
MO	56.6%	57.5%	0.9%	2.2%	2.3%	0.1%
MS	27.6%	30.0%	2.4%	1.3%	1.4%	0.1%
MT	26.5%	31.4%	4.9%	0.1%	0.1%	0.0%
NC	54.9%	58.9%	4.0%	7.4%	7.7%	0.3%
ND	40.0%	46.9%	6.9%	0.2%	0.2%	0.1%
NE	53.8%	56.8%	3.0%	0.5%	0.5%	0.1%

NH	47.3%	48.2%	0.8%	5.8%	6.1%	0.3%
NJ	92.2%	93.0%	0.7%	37.7%	38.1%	0.4%
NM	53.7%	55.2%	1.5%	0.4%	0.4%	0.0%
NV	86.5%	87.0%	0.5%	0.6%	0.6%	0.0%
NY	82.7%	83.5%	0.9%	7.4%	7.5%	0.1%
OH	65.3%	66.6%	1.3%	8.8%	9.0%	0.2%
OK	45.8%	47.9%	2.2%	1.2%	1.3%	0.0%
OR	62.5%	63.6%	1.1%	0.8%	0.8%	0.0%
PA	70.7%	71.8%	1.1%	9.0%	9.2%	0.1%
RI	90.5%	90.4%	0.0%	38.4%	38.5%	0.1%
SC	55.8%	61.9%	6.1%	6.5%	7.1%	0.6%
SD	29.9%	32.2%	2.3%	0.1%	0.2%	0.0%
TN	54.4%	56.3%	2.0%	5.3%	5.4%	0.1%
TX	75.4%	77.9%	2.6%	2.8%	2.9%	0.2%
UT	81.2%	81.7%	0.6%	0.9%	1.0%	0.0%
VA	69.8%	71.2%	1.4%	5.8%	5.8%	0.0%
VT	17.4%	18.2%	0.9%	0.7%	0.7%	0.0%
WA	75.0%	76.7%	1.7%	3.0%	3.0%	0.1%
WI	55.8%	57.5%	1.7%	2.6%	2.7%	0.1%
WV	33.2%	33.8%	0.6%	1.8%	1.7%	-0.1%
WY	24.5%	25.9%	1.4%	0.1%	0.1%	0.0%

A.13 Scenario 2B (75% & 0 Miles) – Percent Change in Urbanized Population and Land Area (2010 – 2020)

State	% Urbanized Population 2010	% Urbanized Population 2020	% Change in Urbanized Population (2010-2020)	% Urbanized Land Area 2010	% Urbanized Land Area 2020	% Change in Urbanized Land Area (2010-2020)
AK	44.5%	51.0%	6.5%	0.1%	0.1%	0.0%
AL	48.6%	50.1%	1.5%	3.4%	3.4%	0.1%
AR	39.5%	40.9%	1.4%	1.4%	1.4%	0.0%
AZ	80.1%	82.5%	2.4%	1.6%	1.7%	0.1%
CA	89.7%	90.3%	0.6%	4.7%	4.7%	0.1%
CO	76.9%	78.6%	1.8%	1.2%	1.2%	0.0%
CT	84.8%	86.1%	1.3%	35.9%	36.6%	0.7%
DE	68.7%	68.5%	-0.3%	14.7%	15.3%	0.6%
FL	87.4%	89.1%	1.6%	12.7%	13.2%	0.5%
GA	65.4%	68.4%	3.0%	6.9%	7.2%	0.4%
HI	71.5%	71.3%	-0.1%	3.5%	3.6%	0.1%
IA	41.7%	44.2%	2.6%	1.0%	1.1%	0.1%
ID	50.5%	55.9%	5.4%	0.4%	0.4%	0.0%
IL	80.0%	80.3%	0.3%	6.0%	6.0%	0.0%
IN	59.2%	61.2%	2.0%	5.6%	5.7%	0.1%
KS	50.2%	51.7%	1.5%	0.8%	0.8%	0.0%
KY	41.0%	43.0%	2.0%	2.2%	2.3%	0.2%
LA	61.3%	63.3%	2.0%	3.6%	3.7%	0.2%
MA	90.3%	90.9%	0.6%	37.1%	37.6%	0.5%

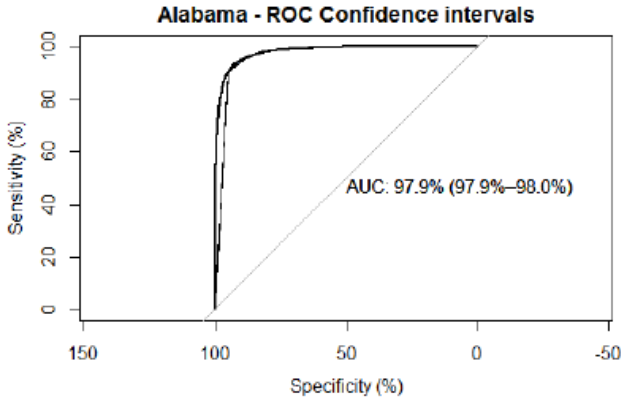
MD	83.5%	84.2%	0.6%	19.0%	19.2%	0.2%
ME	26.2%	26.0%	-0.2%	0.8%	0.8%	0.0%
MI	66.4%	67.4%	1.0%	5.4%	5.5%	0.2%
MN	58.0%	59.6%	1.6%	1.5%	1.6%	0.1%
MO	56.6%	57.3%	0.7%	2.2%	2.3%	0.1%
MS	27.6%	30.0%	2.4%	1.3%	1.4%	0.1%
MT	26.5%	31.4%	4.9%	0.1%	0.1%	0.0%
NC	54.9%	58.7%	3.8%	7.4%	7.7%	0.3%
ND	40.0%	46.9%	6.9%	0.2%	0.2%	0.1%
NE	53.8%	56.5%	2.7%	0.5%	0.5%	0.1%
NH	47.3%	47.9%	0.6%	5.8%	6.0%	0.2%
NJ	92.2%	93.0%	0.7%	37.7%	38.1%	0.4%
NM	53.7%	54.5%	0.7%	0.4%	0.4%	0.0%
NV	86.5%	87.0%	0.5%	0.6%	0.6%	0.0%
NY	82.7%	83.3%	0.7%	7.4%	7.5%	0.0%
OH	65.3%	66.1%	0.8%	8.8%	8.9%	0.1%
OK	45.8%	47.8%	2.0%	1.2%	1.3%	0.0%
OR	62.5%	63.6%	1.1%	0.8%	0.8%	0.0%
PA	70.7%	71.7%	1.0%	9.0%	9.2%	0.1%
RI	90.5%	90.4%	0.0%	38.4%	38.5%	0.1%
SC	55.8%	60.7%	4.9%	6.5%	6.9%	0.4%
SD	29.9%	32.2%	2.3%	0.1%	0.2%	0.0%
TN	54.4%	56.1%	1.7%	5.3%	5.4%	0.1%
TX	75.4%	77.6%	2.2%	2.8%	2.9%	0.1%

UT	81.2%	81.7%	0.6%	0.9%	1.0%	0.0%
VA	69.8%	71.2%	1.4%	5.8%	5.8%	0.0%
VT	17.4%	18.2%	0.8%	0.7%	0.7%	0.0%
WA	75.0%	76.3%	1.3%	3.0%	3.0%	0.0%
WI	55.8%	56.7%	0.9%	2.6%	2.6%	0.1%
WV	33.2%	33.8%	0.6%	1.8%	1.7%	-0.1%
WY	24.5%	25.9%	1.4%	0.1%	0.1%	0.0%

APPENDIX B. STATE REGRESSION MODEL STATISTICS

B.1 Alabama

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.01	0.047	0.05	-60.1	0.04	0.05
Number of Jobs in Tract (Natural Log)	0.78	0.686	0.02	41.36	2.1	2.26
Urban (UC or UA in 2000)	6.25	0.998	0.03	191.08	487.18	553.85
Closest Urban is an Urbanized Area (LSAD 75)	1.24	0.776	0.02	65.47	3.34	3.6
2010 Population Density from 500 to under 1000 psm	1.71	0.847	0.03	49.12	5.18	5.94
2010 Population Density from 1000 to under 2000 psm	1.91	0.871	0.04	54.01	6.33	7.27
2010 Population Density from 2000 to under 4000 psm	2.33	0.911	0.04	59.66	9.55	11.13
2010 Population Density 4000 psm and over	2.3	0.909	0.05	49.14	9.13	10.97
Rural & Less than 1 Mile from Urban	3.56	0.972	0.03	113.75	33.13	37.45
Rural & Less than 2 Miles from Urban	2.01	0.882	0.04	49.86	6.89	8.07
Rural & Less than 4 Miles from Urban	1.49	0.816	0.04	38.34	4.12	4.8
Constant	-6.64	0.001	0.06	-102.27	0	0



Model Fit

X^2 (11) = 235960.99

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.85

Pseudo-R^2 (McFadden) = 0.73

AIC = 85707.05

BIC = 85831.52

Confusion Matrix & Statistics

Accuracy: 0.9291

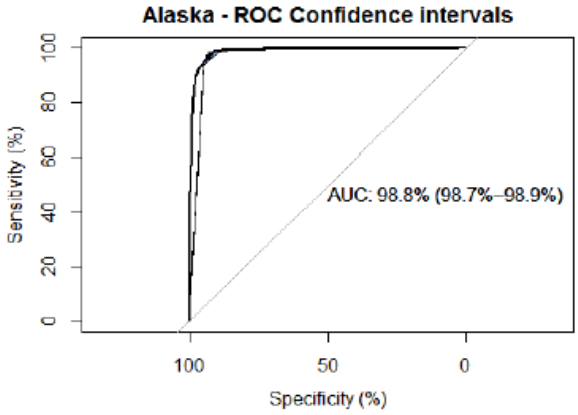
Sensitivity: 0.9438

Specificity: 0.9090

	Predicted: No	Predicted: Yes
Actual: No	128880	9068
Actual: Yes	7670	90576

B.2 Alaska

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Number of Jobs in Tract (Natural Log)	0.14	0.535	0.05	2.56	0	0
Urban (UC or UA in 2000)	8.06	1.000	0.16	51.59	1.03	1.27
Closest Urban is an Urbanized Area (LSAD 75)	0.66	0.659	0.07	9.78	2336.07	4310.59
2010 Population Density from 500 to under 1000 psm	1.96	0.877	0.12	16.43	1.7	2.22
2010 Population Density 4000 psm and over	2.04	0.885	0.09	23.75	5.62	8.98
Rural & Less than 1 Mile from Urban	5.62	0.996	0.16	36.27	6.52	9.14
Rural & Less than 2 Miles from Urban	3.67	0.975	0.18	20.1	204.24	375.05
Rural & Less than 4 Miles from Urban	3.38	0.967	0.19	17.98	27.48	56.25
Constant	-6.96	0.001	0.21	-32.46	20.39	42.63



Model Fit

X^2 (8) = 26320.19

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.80

AIC = 6511.84

BIC = 6585.65

Confusion Matrix & Statistics

Accuracy: 0.9545

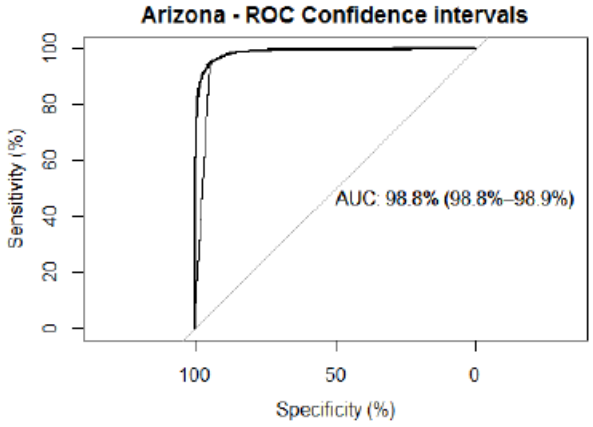
Sensitivity: 0.9756

Specificity: 0.9048

	Predicted: No	Predicted: Yes
Actual: No	18428	765
Actual: Yes	460	7267

B.3 Arizona

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Number of Jobs in Tract (Natural Log)	0.18	0.545	0.02	11.11	1.16	1.24
Urban (UC or UA in 2000)	6.31	0.998	0.03	181.19	511.9	586.73
Closest Urban is an Urbanized Area (LSAD 75)	1.7	0.846	0.02	78.15	5.25	5.71
2010 Population Density from 500 to under 1000 psm	2.35	0.913	0.05	52.27	9.64	11.5
2010 Population Density from 1000 to under 2000 psm	2.77	0.941	0.04	62.67	14.58	17.33
2010 Population Density from 2000 to under 4000 psm	3.18	0.960	0.04	72.01	21.96	26.11
2010 Population Density 4000 psm and over	4.33	0.987	0.04	111.54	70.34	81.91
Rural & Less than 1 Mile from Urban	3.75	0.977	0.03	119.9	40.1	45.33
Rural & Less than 2 Miles from Urban	2.28	0.907	0.04	56.53	9.02	10.56
Rural & Less than 4 Miles from Urban	1.05	0.741	0.04	25.05	2.64	3.11
Constant	-5.48	0.004	0.05	-111.06	0	0



Model Fit

X^2 (10) = 263233.73

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.81

AIC = 63656.71

BIC = 63770.89

Confusion Matrix & Statistics

Accuracy: 0.9479

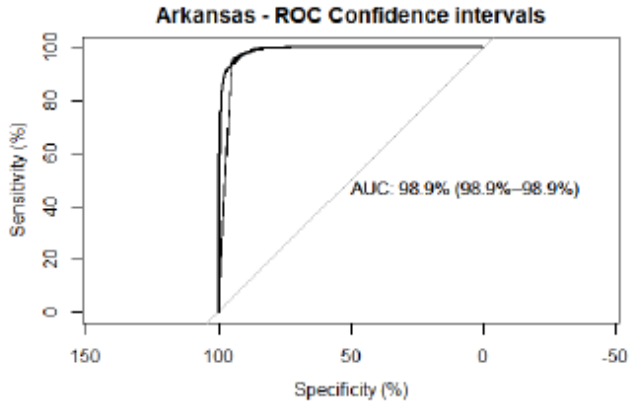
Sensitivity: 0.9522

Specificity: 0.9426

	Predicted: No	Predicted: Yes
Actual: No	126038	6059
Actual: Yes	6333	99534

B.4 Arkansas

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.84	0.137	0.1	-18.89	0.13	0.19
Number of Jobs in Tract (Natural Log)	0.57	0.639	0.03	19.4	1.67	1.88
Urban (UC or UA in 2000)	8.91	1.000	0.11	78.86	5955.68	9275.86
Closest Urban is an Urbanized Area (LSAD 75)	0.82	0.694	0.03	31.07	2.15	2.38
2010 Population Density from 500 to under 1000 psm	1.84	0.863	0.05	36.02	5.67	6.93
2010 Population Density from 1000 to under 2000 psm	2	0.881	0.05	38.19	6.64	8.15
2010 Population Density from 2000 to under 4000 psm	2.51	0.925	0.06	43.53	10.97	13.75
2010 Population Density 4000 psm and over	3.09	0.956	0.07	45.05	19.14	25.03
Rural & Less than 1 Mile from Urban	6.27	0.998	0.11	55.79	425.06	660.49
Rural & Less than 2 Miles from Urban	4.59	0.990	0.12	39.07	77.91	123.43
Rural & Less than 4 Miles from Urban	3.23	0.962	0.12	26.58	20	32.23
Constant	-9.05	0.000	0.14	-64.01	0	0



Model Fit

X^2 (11) = 167408.76

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.88

Pseudo-R^2 (McFadden) = 0.80

AIC = 41984.81

BIC = 42105.57

Confusion Matrix & Statistics

Accuracy: 0.9527

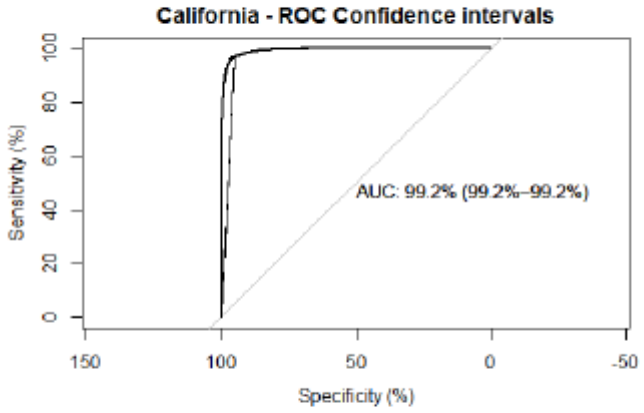
Sensitivity: 0.9733

Specificity: 0.9027

	Predicted: No	Predicted: Yes
Actual: No	119589	4921
Actual: Yes	3284	45652

B.5 California

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.24	0.096	0.03	-64.93	0.1	0.11
Number of Jobs in Tract (Natural Log)	0.55	0.634	0.01	41.27	1.69	1.78
Urban (UC or UA in 2000)	7.65	1.000	0.04	210.96	1962.68	2262.6
Closest Urban is an Urbanized Area (LSAD 75)	1.41	0.804	0.02	90.54	3.96	4.21
2010 Population Density from 500 to under 1000 psm	2.24	0.904	0.04	63.78	8.78	10.07
2010 Population Density from 1000 to under 2000 psm	2.55	0.928	0.04	64.17	11.84	13.83
2010 Population Density from 2000 to under 4000 psm	3.2	0.961	0.04	76.48	22.68	26.73
2010 Population Density 4000 psm and over	4.31	0.987	0.03	133.12	69.57	78.97
Rural & Less than 1 Mile from Urban	4.46	0.989	0.04	124.67	80.83	93.01
Rural & Less than 2 Miles from Urban	2.67	0.935	0.04	65.66	13.39	15.71
Rural & Less than 4 Miles from Urban	1.25	0.777	0.05	26.65	3.19	3.83
Constant	-7.29	0.001	0.06	-131.84	0	0



Model Fit

X^2 (11) = 753017.90

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.91

Pseudo-R^2 (McFadden) = 0.84

AIC = 145507.96

BIC = 145645.32

Confusion Matrix & Statistics

Accuracy: 0.9613

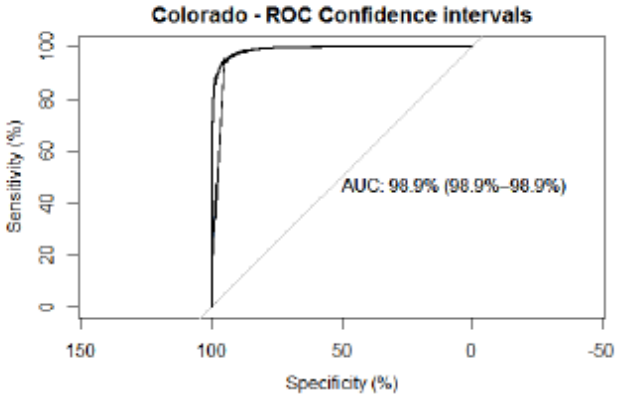
Sensitivity: 0.9441

Specificity: 0.9707

	Predicted: No	Predicted: Yes
Actual: No	230917	13104
Actual: Yes	13670	433755

B.6 Colorado

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.5	0.076	0.07	-34.74	0.07	0.09
Number of Jobs in Tract (Natural Log)	0.15	0.537	0.02	6.71	1.11	1.22
Urban (UC or UA in 2000)	7.68	1.000	0.05	148.01	1953.59	2394.19
Closest Urban is an Urbanized Area (LSAD 75)	1.18	0.765	0.02	48.94	3.1	3.4
2010 Population Density from 500 to under 1000 psm	2.01	0.882	0.05	36.76	6.68	8.27
2010 Population Density from 1000 to under 2000 psm	2.5	0.924	0.06	42.53	10.86	13.67
2010 Population Density from 2000 to under 4000 psm	2.96	0.951	0.06	51.55	17.22	21.56
2010 Population Density 4000 psm and over	3.95	0.981	0.05	80.33	47.36	57.44
Rural & Less than 1 Mile from Urban	5.11	0.994	0.05	102.45	149.74	182.05
Rural & Less than 2 Miles from Urban	3.7	0.976	0.06	65.14	36.11	45.11
Rural & Less than 4 Miles from Urban	2.94	0.950	0.06	51.45	16.96	21.22
Constant	-6.15	0.002	0.08	-72.97	0	0



Model Fit

X^2 (10) = 263233.73

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.81

AIC = 63656.71

BIC = 63770.89

Confusion Matrix & Statistics

Accuracy: 0.9479

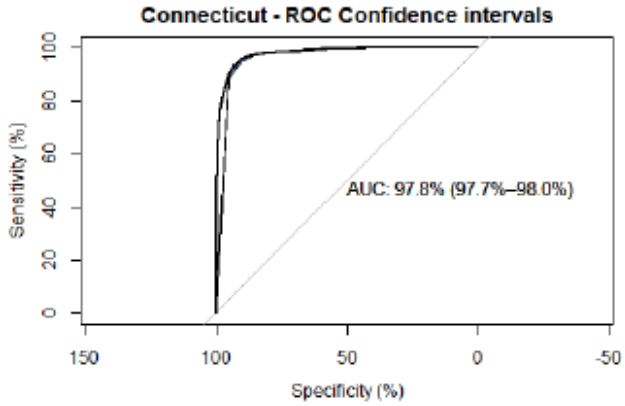
Sensitivity: 0.9522

Specificity: 0.9426

	Predicted: No	Predicted: Yes
Actual: No	96359	5245
Actual: Yes	5012	88021

B.7 Connecticut

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-4.38	0.012	0.18	-24.73	0.01	0.02
Number of Jobs in Tract (Natural Log)	0.42	0.603	0.04	9.61	1.4	1.66
Urban (UC or UA in 2000)	7.71	1.000	0.23	33.19	1412.84	3511.31
Closest Urban is an Urbanized Area (LSAD 75)	0.88	0.707	0.06	15.74	2.15	2.68
2010 Population Density from 500 to under 1000 psm	2.21	0.901	0.07	31.25	7.9	10.42
2010 Population Density from 1000 to under 2000 psm	2.35	0.913	0.08	27.98	8.91	12.4
2010 Population Density from 2000 to under 4000 psm	2.78	0.942	0.1	26.9	13.2	19.81
2010 Population Density 4000 psm and over	3.07	0.956	0.1	29.38	17.63	26.58
Rural & Less than 1 Mile from Urban	4.2	0.985	0.23	18.09	42.23	104.87
Rural & Less than 2 Miles from Urban	2.21	0.901	0.24	9.1	5.65	14.63
Rural & Less than 4 Miles from Urban	1.61	0.833	0.25	6.42	3.06	8.19
Constant	-6.9	0.001	0.27	-25.86	0	0



Model Fit

X^2 (11) = 49449.87

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.82

Pseudo-R^2 (McFadden) = 0.72

AIC = 19278.45

BIC = 19387.22

Confusion Matrix & Statistics

Accuracy: 0.9455

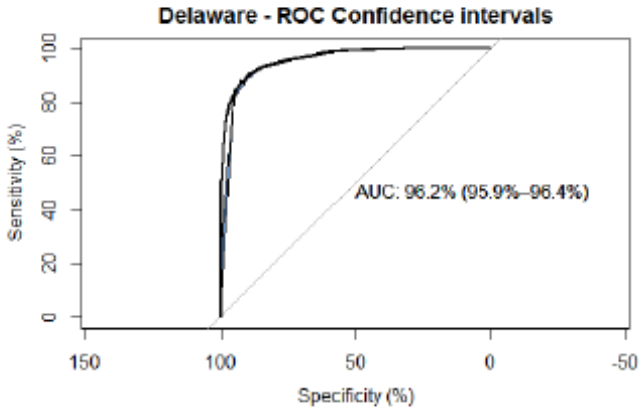
Sensitivity: 0.8862

Specificity: 0.9631

	Predicted: No	Predicted: Yes
Actual: No	12954	1817
Actual: Yes	1663	47425

B.8 Delaware

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-4.27	0.014	0.21	-20.42	0.01	0.02
Number of Jobs in Tract (Natural Log)	0.25	0.562	0.06	4.48	1.15	1.43
Urban (UC or UA in 2000)	6.55	0.999	0.16	40.99	510.24	954.41
Closest Urban is an Urbanized Area (LSAD 75)	0.25	0.562	0.06	4.42	1.15	1.44
2010 Population Density from 500 to under 1000 psm	1.86	0.865	0.1	17.83	5.23	7.88
2010 Population Density from 1000 to under 2000 psm	2.12	0.893	0.1	22.1	6.89	10.03
2010 Population Density from 2000 to under 4000 psm	2.78	0.942	0.11	24.89	12.96	20.09
2010 Population Density 4000 psm and over	2.87	0.946	0.11	25.47	14.16	22.03
Rural & Less than 1 Mile from Urban	3.97	0.981	0.15	25.76	39.17	71.66
Rural & Less than 2 Miles from Urban	2.65	0.934	0.16	16.4	10.35	19.53
Rural & Less than 4 Miles from Urban	1.72	0.848	0.16	10.79	4.09	7.65
Constant	-4.46	0.011	0.22	-20.33	0.01	0.02



Model Fit

X^2 (11) = 17114.35

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.75

Pseudo-R^2 (McFadden) = 0.62

AIC = 10355.09

BIC = 10451.73

Confusion Matrix & Statistics

Accuracy: 0.9033

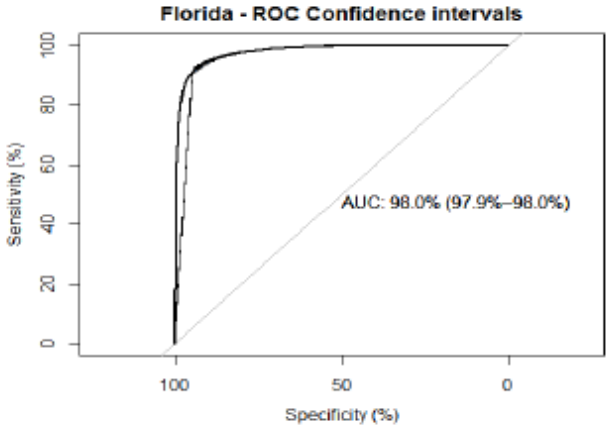
Sensitivity: 0.8167

Specificity: 0.9365

	Predicted: No	Predicted: Yes
Actual: No	5263	1067
Actual: Yes	1181	15737

B.9 Florida

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.13	0.244	0.03	-33.8	0.3	0.34
Number of Jobs in Tract (Natural Log)	0.04	0.510	0.01	3.44	1.02	1.07
Urban (UC or UA in 2000)	6.71	0.999	0.03	229.96	775.96	870.01
Closest Urban is an Urbanized Area (LSAD 75)	0.85	0.701	0.01	57.74	2.27	2.41
2010 Population Density from 500 to under 1000 psm	2.01	0.882	0.03	74.44	7.1	7.89
2010 Population Density from 1000 to under 2000 psm	2.32	0.911	0.03	83.13	9.59	10.7
2010 Population Density from 2000 to under 4000 psm	2.6	0.931	0.03	84.25	12.67	14.29
2010 Population Density 4000 psm and over	2.83	0.944	0.03	90.54	15.95	18.03
Rural & Less than 1 Mile from Urban	3.83	0.979	0.03	141.67	43.81	48.71
Rural & Less than 2 Miles from Urban	2.75	0.940	0.03	91.45	14.76	16.61
Rural & Less than 4 Miles from Urban	1.97	0.878	0.03	63.11	6.72	7.59
Constant	-4.4	0.012	0.05	-96.49	0.01	0.01



Model Fit

X^2 (11) = 376836.87

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.83

Pseudo-R^2 (McFadden) = 0.72

AIC = 145189.16

BIC = 145321.49

Confusion Matrix & Statistics

Accuracy: 0.9347

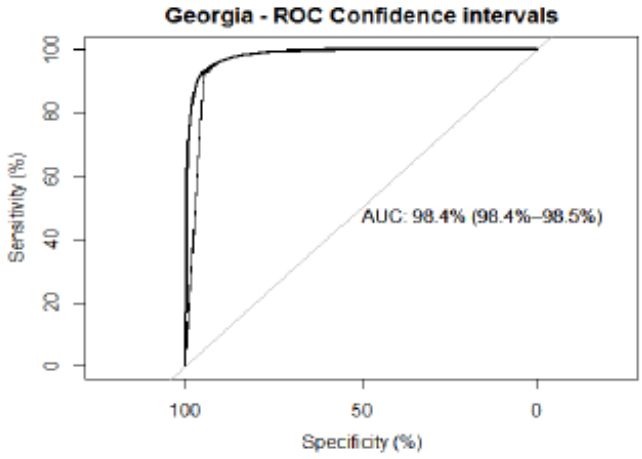
Sensitivity: 0.8651

Specificity: 0.9592

	Predicted: No	Predicted: Yes
Actual: No	102550	13725
Actual: Yes	15997	322735

B.10 Georgia

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.3	0.036	0.07	-50.46	0.03	0.04
Number of Jobs in Tract (Natural Log)	1.03	0.737	0.02	51.02	2.69	2.91
Urban (UC or UA in 2000)	6.03	0.998	0.03	191.77	391.06	442.36
Closest Urban is an Urbanized Area (LSAD 75)	1.4	0.802	0.02	74.56	3.9	4.2
2010 Population Density from 500 to under 1000 psm	2.08	0.889	0.03	62.92	7.51	8.54
2010 Population Density from 1000 to under 2000 psm	2.31	0.910	0.03	68.05	9.46	10.81
2010 Population Density from 2000 to under 4000 psm	2.89	0.947	0.04	72.14	16.71	19.55
2010 Population Density 4000 psm and over	3.11	0.957	0.05	61.67	20.34	24.78
Rural & Less than 1 Mile from Urban	3.22	0.962	0.03	107.69	23.56	26.49
Rural & Less than 2 Miles from Urban	1.45	0.810	0.04	36.61	3.96	4.63
Rural & Less than 4 Miles from Urban	0.65	0.657	0.04	15.39	1.76	2.07
Constant	-7.25	0.001	0.07	-106.34	0	0



Model Fit

X^2 (11) = 288956.31

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.87

Pseudo-R^2 (McFadden) = 0.77

AIC = 86624.86

BIC = 86750.99

Confusion Matrix & Statistics

Accuracy: 0.9382

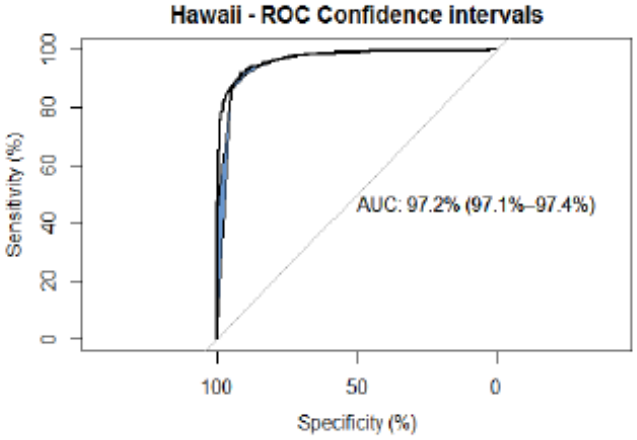
Sensitivity: 0.9484

Specificity: 0.9270

	Predicted: No	Predicted: Yes
Actual: No	134275	9472
Actual: Yes	7301	120234

B.11 Hawaii

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Number of Jobs in Tract (Natural Log)	0.76	0.681	0.04	17.42	1.96	2.33
Urban (UC or UA in 2000)	4.24	0.986	0.08	52.45	59.31	81.43
Closest Urban is an Urbanized Area (LSAD 75)	2.06	0.887	0.07	30.69	6.86	8.92
2010 Population Density from 500 to under 1000 psm	3.01	0.953	0.12	26.1	16.16	25.39
2010 Population Density from 1000 to under 2000 psm	3.17	0.960	0.13	23.94	18.34	30.81
2010 Population Density from 2000 to under 4000 psm	3.22	0.962	0.15	21.81	18.78	33.51
2010 Population Density 4000 psm and over	3.3	0.964	0.11	29.51	21.73	33.67
Rural & Less than 1 Mile from Urban	1.8	0.858	0.08	22.34	5.17	7.09
Rural & Less than 2 Miles from Urban	-0.2	0.450	0.13	-1.54	0.63	1.06
Constant	-5.79	0.003	0.14	-40.45	0	0



Model Fit

X^2 (9) = 22795.46

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.83

Pseudo-R^2 (McFadden) = 0.70

AIC = 9974.79

BIC = 10055.49

Confusion Matrix & Statistics

Accuracy: 0.9125

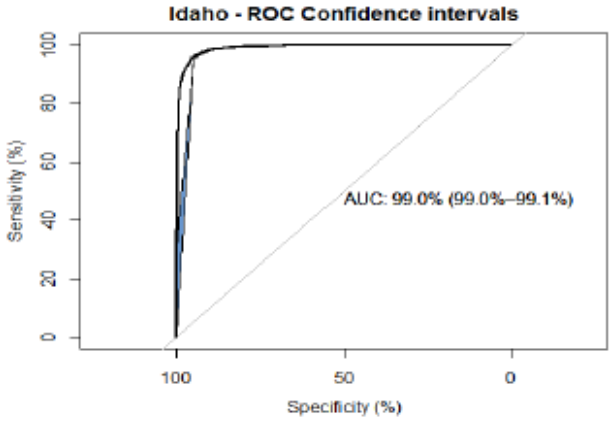
Sensitivity: 0.9179

Specificity: 0.9072

	Predicted: No	Predicted: Yes
Actual: No	10707	1110
Actual: Yes	958	10852

B.12 Idaho

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.16	0.103	0.09	-24.03	0.1	0.14
Number of Jobs in Tract (Natural Log)	1.09	0.748	0.04	25.04	2.74	3.25
Urban (UC or UA in 2000)	6.86	0.999	0.06	123.86	852.45	1059.03
Closest Urban is an Urbanized Area (LSAD 75)	1.19	0.767	0.03	35.47	3.09	3.53
2010 Population Density from 500 to under 1000 psm	1.88	0.868	0.07	27.04	5.72	7.52
2010 Population Density from 1000 to under 2000 psm	2.05	0.886	0.07	31.43	6.85	8.85
2010 Population Density from 2000 to under 4000 psm	2.6	0.931	0.06	42.41	11.99	15.26
2010 Population Density 4000 psm and over	3.37	0.967	0.06	59.59	26.1	32.59
Rural & Less than 1 Mile from Urban	4.17	0.985	0.05	79.74	58.2	71.43
Rural & Less than 2 Miles from Urban	2.15	0.896	0.07	29.62	7.43	9.87
Rural & Less than 4 Miles from Urban	1.72	0.848	0.07	25.83	4.92	6.39
Constant	-8.63	0.000	0.14	-59.82	0	0



Model Fit

X^2 (11) = 125773.53

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.81

AIC = 28960.49

BIC = 29078.84

Confusion Matrix & Statistics

Accuracy: 0.9618

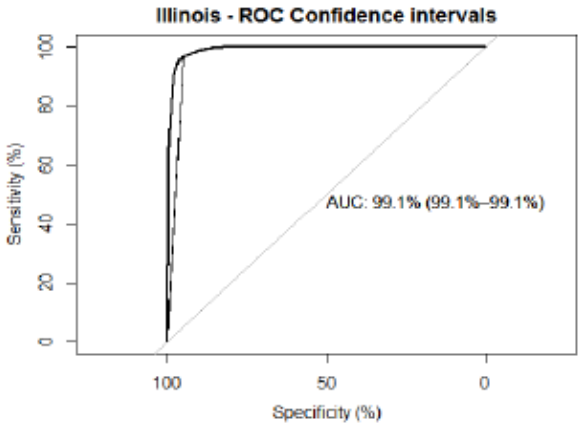
Sensitivity: 0.9793

Specificity: 0.9046

	Predicted: No	Predicted: Yes
Actual: No	106125	3183
Actual: Yes	2238	30188

B.13 Illinois

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.95	0.050	0.06	-47.44	0.05	0.06
Number of Jobs in Tract (Natural Log)	0.66	0.659	0.02	35.67	1.87	2.01
Urban (UC or UA in 2000)	8.54	1.000	0.06	147.45	4577.67	5744.78
Closest Urban is an Urbanized Area (LSAD 75)	1.57	0.828	0.02	87.32	4.62	4.96
2010 Population Density from 500 to under 1000 psm	1.85	0.864	0.05	39.99	5.8	6.95
2010 Population Density from 1000 to under 2000 psm	1.91	0.871	0.04	46.85	6.21	7.28
2010 Population Density from 2000 to under 4000 psm	2.09	0.890	0.04	59.3	7.55	8.67
2010 Population Density 4000 psm and over	3.06	0.955	0.04	85.17	19.93	22.95
Rural & Less than 1 Mile from Urban	5.58	0.996	0.06	95.17	235.6	296.45
Rural & Less than 2 Miles from Urban	3.31	0.965	0.07	49.12	24.06	31.34
Rural & Less than 4 Miles from Urban	2.58	0.930	0.06	39.99	11.64	14.99
Constant	-8.55	0.000	0.08	-107.08	0	0



Model Fit

X^2 (11) = 490101.14

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.91

Pseudo-R^2 (McFadden) = 0.83

AIC = 97056.44

BIC = 97188.28

Confusion Matrix & Statistics

Accuracy: 0.9571

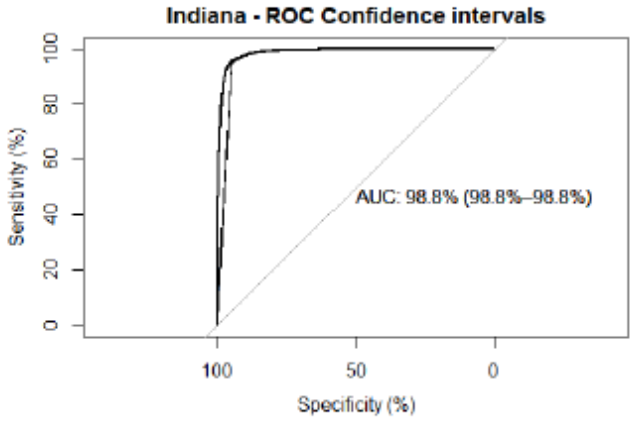
Sensitivity: 0.9376

Specificity: 0.9701

	Predicted: No	Predicted: Yes
Actual: No	163511	7834
Actual: Yes	10875	254053

B.14 Indiana

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.17	0.237	0.12	-81.36	0.27	0.36
Number of Jobs in Tract (Natural Log)	0.75	0.679	0.07	-16	2.03	2.21
Urban (UC or UA in 2000)	9.11	1.000	0.02	33.42	7458.28	11001.23
Closest Urban is an Urbanized Area (LSAD 75)	1.38	0.799	0.1	91.89	3.83	4.15
2010 Population Density from 500 to under 1000 psm	1.89	0.869	0.02	66.18	6.02	7.28
2010 Population Density from 1000 to under 2000 psm	1.97	0.878	0.05	38.95	6.76	7.62
2010 Population Density from 2000 to under 4000 psm	2.62	0.932	0.03	64.31	12.74	14.84
2010 Population Density 4000 psm and over	6.11	0.998	0.04	67.16	371.16	548.24
Rural & Less than 1 Mile from Urban	4.14	0.984	0.1	61.42	51.14	76.96
Rural & Less than 2 Miles from Urban	2.78	0.942	0.1	39.7	13.12	19.85
Rural & Less than 4 Miles from Urban	-9.87	0.000	0.11	26.34	0	0
Constant	-1.17	0.237	0.12	-81.36	0.27	0.36



Model Fit

X^2 (10) = 289972.99

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.81

AIC = 69685.30

BIC = 69800.43

Confusion Matrix & Statistics

Accuracy: 0.9519

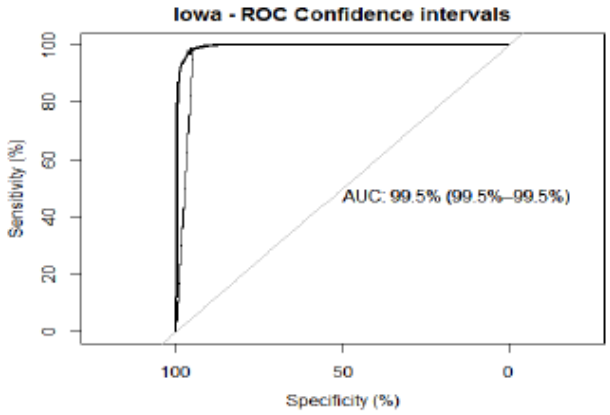
Sensitivity: 0.9508

Specificity: 0.9530

	Predicted: No	Predicted: Yes
Actual: No	122674	6123
Actual: Yes	6353	124278

B.15 Iowa

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.73	0.061	0.1	-26.84	0.05	0.08
Number of Jobs in Tract (Natural Log)	1.16	0.761	0.04	31.12	2.98	3.45
Urban (UC or UA in 2000)	8.93	1.000	0.07	124.5	6557.4	8686.09
Closest Urban is an Urbanized Area (LSAD 75)	1.29	0.784	0.03	41.92	3.42	3.86
2010 Population Density from 500 to under 1000 psm	1.97	0.878	0.08	24.38	6.1	8.37
2010 Population Density from 1000 to under 2000 psm	2.3	0.909	0.08	30.05	8.6	11.62
2010 Population Density from 2000 to under 4000 psm	2.56	0.928	0.06	40.15	11.41	14.64
2010 Population Density 4000 psm and over	3.17	0.960	0.06	49.93	20.94	26.85
Rural & Less than 1 Mile from Urban	5.92	0.997	0.07	81.02	322.41	429.32
Rural & Less than 2 Miles from Urban	3.73	0.977	0.09	41.03	34.72	49.56
Rural & Less than 4 Miles from Urban	2.75	0.940	0.09	31.57	13.14	18.49
Constant	-10.52	0.000	0.14	-77.84	0	0



Model Fit

X^2 (11) = 216121.47

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.92

Pseudo-R^2 (McFadden) = 0.87

AIC = 33404.98

BIC = 33528.09

Confusion Matrix & Statistics

Accuracy: 0.9685

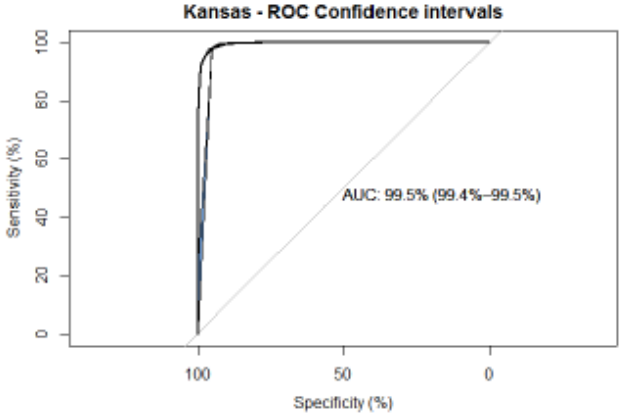
Sensitivity: 0.9797

Specificity: 0.9395

	Predicted: No	Predicted: Yes
Actual: No	149019	3557
Actual: Yes	3081	55193

B.16 Kansas

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.13	0.106	0.09	-24.68	0.1	0.14
Number of Jobs in Tract (Natural Log)	0.86	0.703	0.03	25.15	2.21	2.52
Urban (UC or UA in 2000)	8.46	1.000	0.06	148.54	4220.67	5276.34
Closest Urban is an Urbanized Area (LSAD 75)	1.28	0.782	0.03	40.63	3.4	3.84
2010 Population Density from 500 to under 1000 psm	1.73	0.849	0.07	24.06	4.89	6.49
2010 Population Density from 1000 to under 2000 psm	2.09	0.890	0.06	32.17	7.12	9.18
2010 Population Density from 2000 to under 4000 psm	2.61	0.932	0.06	44.53	12.14	15.28
2010 Population Density 4000 psm and over	3.34	0.966	0.06	53.33	24.89	31.82
Rural & Less than 1 Mile from Urban	5.42	0.996	0.06	95.38	201.27	251.44
Rural & Less than 2 Miles from Urban	3.04	0.954	0.08	39.36	17.89	24.21
Rural & Less than 4 Miles from Urban	2.15	0.896	0.08	27.35	7.34	9.99
Constant	-8.86	0.000	0.12	-74.86	0	0



Model Fit

X^2 (11) = 232721.27

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.92

Pseudo-R^2 (McFadden) = 0.86

AIC = 37843.26

BIC = 37967.48

Confusion Matrix & Statistics

Accuracy: 0.9691

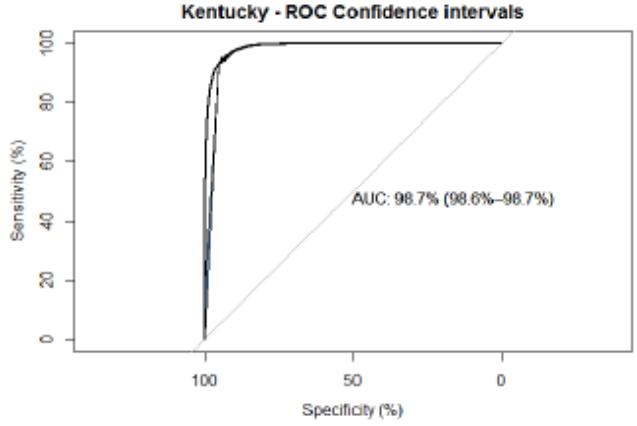
Sensitivity: 0.9830

Specificity: 0.9320

	Predicted: No	Predicted: Yes
Actual: No	165547	4275
Actual: Yes	2870	58558

B.17 Kentucky

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.24	0.038	0.14	-22.94	0.03	15.00%
Number of Jobs in Tract (Natural Log)	0.64	0.655	0.02	26.78	1.81	1.99
Urban (UC or UA in 2000)	8.27	1.000	0.1	86.69	3241.65	4711.86
Closest Urban is an Urbanized Area (LSAD 75)	1.13	0.756	0.03	39.43	2.93	3.28
2010 Population Density from 500 to under 1000 psm	1.69	0.844	0.05	30.77	4.87	6.03
2010 Population Density from 1000 to under 2000 psm	1.88	0.868	0.06	34.75	5.87	7.25
2010 Population Density from 2000 to under 4000 psm	2.1	0.891	0.06	37.16	7.34	9.17
2010 Population Density 4000 psm and over	2.79	0.942	0.1	44.07	14.37	18.41
Rural & Less than 1 Mile from Urban	5.83	0.997	0.1	61.26	283.75	412.17
Rural & Less than 2 Miles from Urban	3.71	0.976	0.1	35.7	33.42	50.25
Rural & Less than 4 Miles from Urban	2.95	0.950	0.1	28.21	15.51	23.36
Constant	-8.55	0.000	0.12	-71.96	0	0.00



Model Fit

X^2 (11) = 151310.31

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.88

Pseudo-R^2 (McFadden) = 0.79

AIC = 41384.04

BIC = 41502.69

Confusion Matrix & Statistics

Accuracy: 0.9422

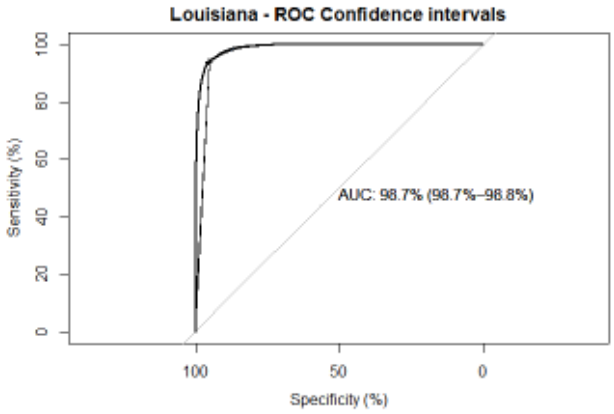
Sensitivity: 0.9560

Specificity: 0.9193

	Predicted: No	Predicted: Yes
Actual: No	86571	4423
Actual: Yes	3987	50402

B.18 Louisiana

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.98	0.018	0.11	-37.2	0.02	0.02
Number of Jobs in Tract (Natural Log)	0.73	0.675	0.02	33.33	1.98	2.16
Urban (UC or UA in 2000)	8.27	1.000	0.08	109.82	3352.89	4503.41
Closest Urban is an Urbanized Area (LSAD 75)	1.15	0.760	0.02	49.22	3.02	3.32
2010 Population Density from 500 to under 1000 psm	1.89	0.869	0.05	37.02	6.01	7.35
2010 Population Density from 1000 to under 2000 psm	2.09	0.890	0.05	39.2	7.26	8.95
2010 Population Density from 2000 to under 4000 psm	2.39	0.916	0.06	41.25	9.75	12.24
2010 Population Density 4000 psm and over	2.78	0.942	0.06	48.18	14.4	18.06
Rural & Less than 1 Mile from Urban	5.22	0.995	0.07	69.88	159.27	213.42
Rural & Less than 2 Miles from Urban	3.4	0.968	0.08	41.47	25.44	35.08
Rural & Less than 4 Miles from Urban	2.82	0.944	0.08	34.99	14.28	19.57
Constant	-8.15	0.000	0.1	-82.67	0	0



Model Fit

X^2 (11) = 208834.46

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.79

AIC = 53967.81

BIC = 54089.64

Confusion Matrix & Statistics

Accuracy: 0.9444

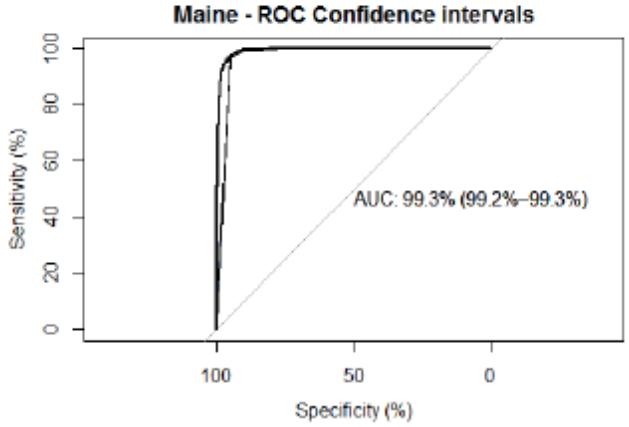
Sensitivity: 0.9473

Specificity: 0.9416

	Predicted: No	Predicted: Yes
Actual: No	89115	5579
Actual: Yes	4962	89906

B.19 Maine

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Number of Jobs in Tract (Natural Log)	1.96	0.877	0.07	28.88	6.2	8.08
Urban (UC or UA in 2000)	7.21	0.999	0.1	70.31	1101.67	1646.34
Closest Urban is an Urbanized Area (LSAD 75)	1.02	0.735	0.05	18.96	2.49	3.07
2010 Population Density from 500 to under 1000 psm	1.45	0.810	0.1	15.07	3.54	5.17
2010 Population Density from 1000 to under 2000 psm	1.57	0.828	0.1	14.94	3.9	5.89
2010 Population Density from 2000 to under 4000 psm	1.95	0.875	0.11	18.01	5.67	8.67
2010 Population Density 4000 psm and over	2.07	0.888	0.1	21.13	6.53	9.59
Rural & Less than 1 Mile from Urban	4.17	0.985	0.1	40.22	53.03	79.65
Rural & Less than 2 Miles from Urban	1.71	0.847	0.15	11.02	4.06	7.45
Constant	-12.23	0.000	0.24	-51.66	0	0



Model Fit

X^2 (9) = 52284.31

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.83

AIC = 10747.90

BIC = 10838.24

Confusion Matrix & Statistics

Accuracy: 0.9681

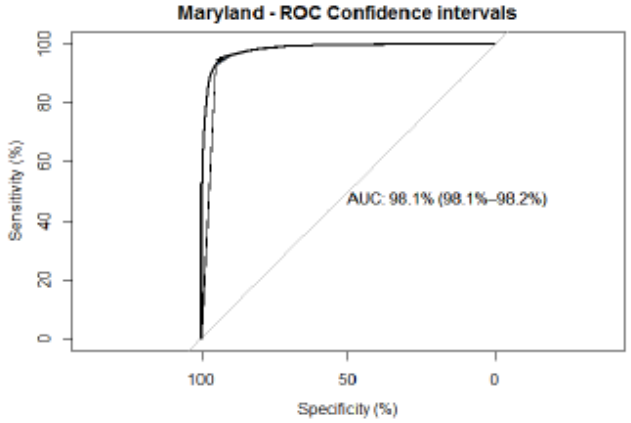
Sensitivity: 0.9786

Specificity: 0.9279

	Predicted: No	Predicted: Yes
Actual: No	48157	920
Actual: Yes	1054	11837

B.20 Maryland

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.91	0.020	0.11	-36.75	0.02	0.02
Number of Jobs in Tract (Natural Log)	0.63	0.652	0.03	23.63	1.79	1.99
Urban (UC or UA in 2000)	6.72	0.999	0.06	113.09	739.44	933.46
Closest Urban is an Urbanized Area (LSAD 75)	1.15	0.760	0.03	40.91	2.98	3.32
2010 Population Density from 500 to under 1000 psm	1.36	0.796	0.06	24.43	3.51	4.36
2010 Population Density from 1000 to under 2000 psm	1.47	0.813	0.06	24.79	3.88	4.89
2010 Population Density from 2000 to under 4000 psm	1.84	0.863	0.06	32.28	5.63	7.04
2010 Population Density 4000 psm and over	2.17	0.898	0.05	47.8	7.99	9.54
Rural & Less than 1 Mile from Urban	3.26	0.963	0.06	56.15	23.29	29.25
Rural & Less than 2 Miles from Urban	0.93	0.717	0.08	12.35	2.2	2.95
Rural & Less than 4 Miles from Urban	0.92	0.715	0.07	13.26	2.2	2.89
Constant	-6.11	0.002	0.1	-61.85	0	0



Model Fit

X^2 (11) = 129249.75

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.85

Pseudo-R^2 (McFadden) = 0.75

AIC = 43323.57

BIC = 43441.46

Confusion Matrix & Statistics

Accuracy: 0.9427

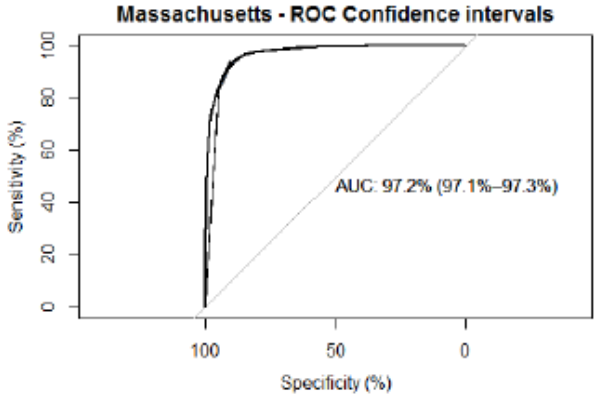
Sensitivity: 0.9170

Specificity: 0.9551

	Predicted: No	Predicted: Yes
Actual: No	40921	4125
Actual: Yes	3702	87780

B.21 Massachusetts

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.39	0.084	0.08	-31.14	0.08	0.11
Number of Jobs in Tract (Natural Log)	0.83	0.696	0.03	27.21	2.16	2.44
Urban (UC or UA in 2000)	6.69	0.999	0.11	58.67	645.46	1009.5
Closest Urban is an Urbanized Area (LSAD 75)	0.96	0.723	0.04	25.82	2.43	2.81
2010 Population Density from 500 to under 1000 psm	1.77	0.854	0.06	30.93	5.22	6.53
2010 Population Density from 1000 to under 2000 psm	1.96	0.877	0.05	42.35	6.47	7.76
2010 Population Density from 2000 to under 4000 psm	2.78	0.942	0.06	43.02	14.2	18.3
2010 Population Density 4000 psm and over	3.36	0.966	0.11	29.36	22.95	35.93
Rural & Less than 1 Mile from Urban	1.41	0.804	0.13	11.1	3.2	5.26
Rural & Less than 2 Miles from Urban	0.96	0.723	0.14	6.94	1.99	3.43
Rural & Less than 4 Miles from Urban	-7.12	0.001	0.14	-49.34	0	0
Constant	-2.39	0.084	0.08	-31.14	0.08	0.11



Model Fit

X^2 (11) = 90998.46

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.77

Pseudo-R^2 (McFadden) = 0.68

AIC = 43713.99

BIC = 43822.64

Confusion Matrix & Statistics

Accuracy: 0.9445

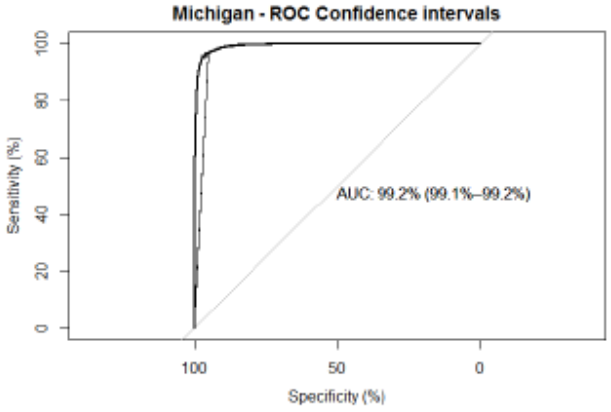
Sensitivity: 0.8481

Specificity: 0.9653

	Predicted: No	Predicted: Yes
Actual: No	21692	4108
Actual: Yes	3886	114242

B.22 Michigan

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.34	0.088	0.06	-40.84	0.09	0.11
Number of Jobs in Tract (Natural Log)	0.52	0.627	0.02	26.57	1.63	1.76
Urban (UC or UA in 2000)	7.3	0.999	0.05	152.83	1351.24	1629.58
Closest Urban is an Urbanized Area (LSAD 75)	1.36	0.796	0.02	62.03	3.74	4.08
2010 Population Density from 500 to under 1000 psm	1.89	0.869	0.04	43.04	6.07	7.21
2010 Population Density from 1000 to under 2000 psm	1.96	0.877	0.04	44.67	6.52	7.75
2010 Population Density from 2000 to under 4000 psm	2.23	0.903	0.04	53.95	8.61	10.13
2010 Population Density 4000 psm and over	3.09	0.956	0.05	67.67	20.16	24.12
Rural & Less than 1 Mile from Urban	4.26	0.986	0.05	88.39	64.65	78.1
Rural & Less than 2 Miles from Urban	2.29	0.908	0.06	38.2	8.81	11.14
Rural & Less than 4 Miles from Urban	1.6	0.832	0.06	27.34	4.41	5.54
Constant	-6.97	0.001	0.07	-93.26	0	0



Model Fit

X^2 (11) = 356519.55

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.92

Pseudo-R^2 (McFadden) = 0.84

AIC = 68114.31

BIC = 68241.91

Confusion Matrix & Statistics

Accuracy: 0.961

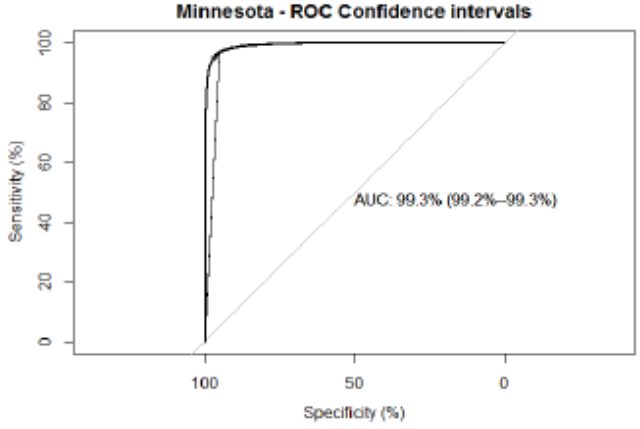
Sensitivity: 0.9622

Specificity: 0.9598

	Predicted: No	Predicted: Yes
Actual: No	151263	5995
Actual: Yes	5945	143238

B.23 Minnesota

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.25	0.095	0.08	-28.13	0.09	0.12
Number of Jobs in Tract (Natural Log)	1.3	0.786	0.03	42.17	3.45	3.89
Urban (UC or UA in 2000)	7.07	0.999	0.04	167.84	1087.27	1282.6
Closest Urban is an Urbanized Area (LSAD 75)	1.18	0.765	0.03	41.48	3.09	3.45
2010 Population Density from 500 to under 1000 psm	2	0.881	0.06	35.71	6.6	8.21
2010 Population Density from 1000 to under 2000 psm	2.2	0.900	0.05	40.87	8.14	10.06
2010 Population Density from 2000 to under 4000 psm	2.64	0.933	0.05	56.5	12.73	15.29
2010 Population Density 4000 psm and over	3.25	0.963	0.05	70.51	23.57	28.24
Rural & Less than 1 Mile from Urban	4.25	0.986	0.04	107.02	64.98	75.93
Rural & Less than 2 Miles from Urban	1.78	0.856	0.06	28.42	5.24	6.69
Rural & Less than 4 Miles from Urban	0.29	0.572	0.08	3.57	1.14	1.56
Constant	-8.95	0.000	0.1	-86.89	0	0



Model Fit

X^2 (11) = 262191.69

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.91

Pseudo-R^2 (McFadden) = 0.84

AIC = 48771.88

BIC = 48896.57

Confusion Matrix & Statistics

Accuracy: 0.9632

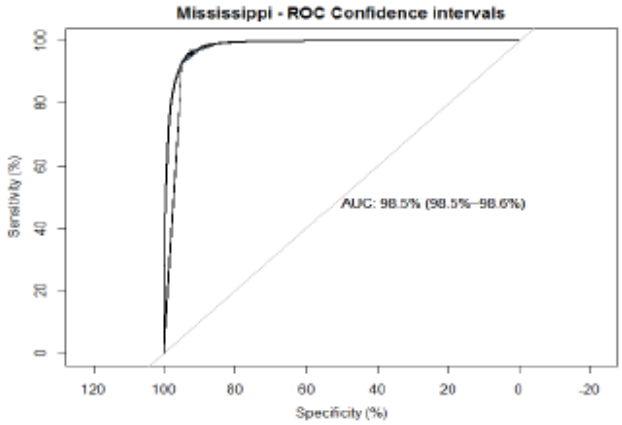
Sensitivity: 09785

Specificity: 0.9344

	Predicted: No	Predicted: Yes
Actual: No	153597	5487
Actual: Yes	3381	78193

B.24 Mississippi

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.28	0.093	0.09	-25.83	0.09	0.12
Number of Jobs in Tract (Natural Log)	0.98	0.727	0.03	35.89	2.53	2.81
Urban (UC or UA in 2000)	7.37	0.999	0.07	112.63	1390.58	1796.91
Closest Urban is an Urbanized Area (LSAD 75)	1.75	0.852	0.03	58.41	5.41	6.08
2010 Population Density from 500 to under 1000 psm	1.61	0.833	0.05	30.53	4.52	5.55
2010 Population Density from 1000 to under 2000 psm	1.68	0.843	0.05	32.34	4.87	5.97
2010 Population Density from 2000 to under 4000 psm	2.27	0.906	0.05	41.31	8.67	10.75
2010 Population Density 4000 psm and over	2.37	0.915	0.06	41.39	9.55	11.95
Rural & Less than 1 Mile from Urban	4.87	0.992	0.07	74.25	114.77	148.43
Rural & Less than 2 Miles from Urban	3.07	0.956	0.08	39.75	18.43	24.94
Rural & Less than 4 Miles from Urban	2.23	0.903	0.08	28.03	7.96	10.87
Constant	-9.02	0.000	0.11	-84.82	0	0



Model Fit

X^2 (11) = 148589.98

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.86

Pseudo-R^2 (McFadden) = 0.76

AIC = 45924.33

BIC = 46044.53

Confusion Matrix & Statistics

Accuracy: 0.9443

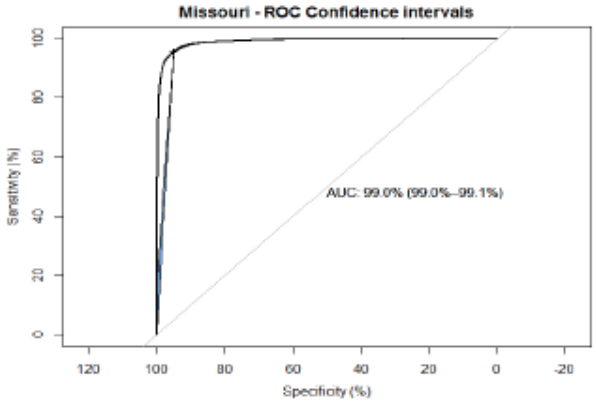
Sensitivity: 0.9602

Specificity: 0.9023

	Predicted: No	Predicted: Yes
Actual: No	115251	4440
Actual: Yes	4771	40989

B.25 Missouri

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.55	0.072	0.07	-37.86	0.07	0.09
Number of Jobs in Tract (Natural Log)	0.99	0.729	0.02	42.24	2.57	2.82
Urban (UC or UA in 2000)	6.64	0.999	0.03	197.05	715.4	816.41
Closest Urban is an Urbanized Area (LSAD 75)	1.62	0.835	0.02	76.18	4.85	5.27
2010 Population Density from 500 to under 1000 psm	1.75	0.852	0.04	39.02	5.29	6.31
2010 Population Density from 1000 to under 2000 psm	1.88	0.868	0.04	44.64	6.05	7.13
2010 Population Density from 2000 to under 4000 psm	2.21	0.901	0.04	57.42	8.43	9.81
2010 Population Density 4000 psm and over	2.69	0.936	0.04	66.31	13.56	15.9
Rural & Less than 1 Mile from Urban	3.71	0.976	0.03	113.05	38.37	43.64
Rural & Less than 2 Miles from Urban	1.61	0.833	0.05	32.23	4.52	5.5
Rural & Less than 4 Miles from Urban	0.5	0.622	0.06	8.82	1.47	1.83
Constant	-7.8	0.000	0.08	-99.65	0	0



Model Fit

X^2 (11) = 349005.41

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.82

AIC = 75639.98

BIC = 75768.23

Confusion Matrix & Statistics

Accuracy: 0.957

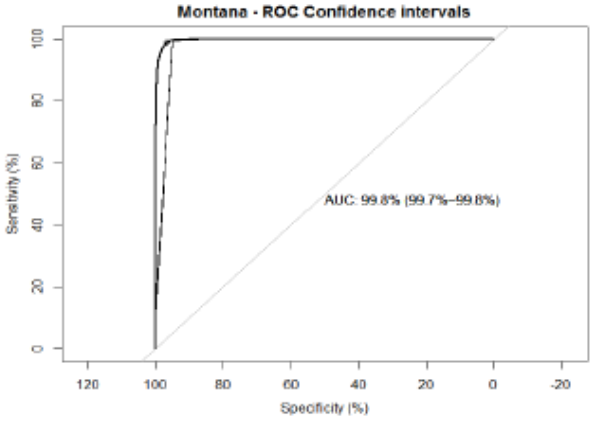
Sensitivity: 0.9703

Specificity: 0.9335

	Predicted: No	Predicted: Yes
Actual: No	200021	7827
Actual: Yes	6115	109947

B.26 Montana

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-4.41	0.012	0.17	-26.25	0.01	0.02
Number of Jobs in Tract (Natural Log)	0.82	0.694	0.07	12.23	1.99	2.59
Urban (UC or UA in 2000)	11.58	1.000	0.25	45.62	65300.1	176687.6
Closest Urban is an Urbanized Area (LSAD 75)	0.95	0.721	0.06	16.29	2.3	2.89
2010 Population Density from 500 to under 1000 psm	2.16	0.897	0.11	19.63	7	10.78
2010 Population Density from 1000 to under 2000 psm	2.62	0.932	0.11	23.18	10.97	17.08
2010 Population Density from 2000 to under 4000 psm	3.12	0.958	0.12	26.68	17.93	28.33
2010 Population Density 4000 psm and over	3.73	0.977	0.13	29.52	32.59	53.49
Rural & Less than 1 Mile from Urban	8.58	1.000	0.25	34	3255.22	8755.5
Rural & Less than 2 Miles from Urban	6.8	0.999	0.26	25.77	533.73	1500.52
Rural & Less than 4 Miles from Urban	6.05	0.998	0.26	23.36	255.89	706.44
Constant	-11.55	0.000	0.32	-36.41	0	0



Model Fit

X^2 (11) = 103380.40

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.93

Pseudo-R^2 (McFadden) = 0.90

AIC = 11716.89

BIC = 11833.82

Confusion Matrix & Statistics

Accuracy: 0.9815

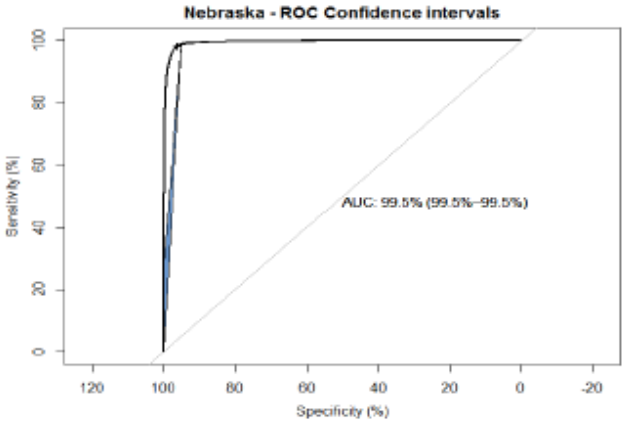
Sensitivity: 0.9912

Specificity: 0.9342

	Predicted: No	Predicted: Yes
Actual: No	103663	1412
Actual: Yes	923	20061

B.27 Nebraska

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.68	0.064	0.13	-20.2	0.05	0.09
Number of Jobs in Tract (Natural Log)	0.51	0.625	0.04	11.92	1.53	1.81
Urban (UC or UA in 2000)	8.4	1.000	0.07	126.29	3893.58	5052.96
Closest Urban is an Urbanized Area (LSAD 75)	1.8	0.858	0.04	43.06	5.58	6.58
2010 Population Density from 500 to under 1000 psm	1.28	0.782	0.09	13.78	3.01	4.33
2010 Population Density from 1000 to under 2000 psm	1.77	0.854	0.08	21.96	5.01	6.87
2010 Population Density from 2000 to under 4000 psm	2.09	0.890	0.07	30.56	7.04	9.2
2010 Population Density 4000 psm and over	2.98	0.952	0.07	43.46	17.28	22.62
Rural & Less than 1 Mile from Urban	5.84	0.997	0.07	86.9	302.79	394.14
Rural & Less than 2 Miles from Urban	3.62	0.974	0.08	43.24	31.69	44
Rural & Less than 4 Miles from Urban	1.42	0.805	0.13	11.15	3.24	5.34
Constant	-7.89	0.000	0.15	-53.87	0	0



Model Fit

X^2 (11) = 20061

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.92

Pseudo-R^2 (McFadden) = 0.87

AIC = 27380.57

BIC = 27502.29

Confusion Matrix & Statistics

Accuracy: 0.9712

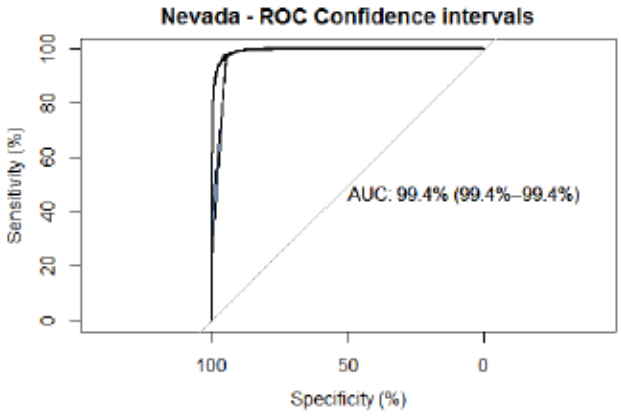
Sensitivity: 0.9848

Specificity: 0.9295

	Predicted: No	Predicted: Yes
Actual: No	139536	3253
Actual: Yes	2156	42910

B.28 Nevada

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.56	0.174	0.11	-13.84	0.17	0.26
Urban (UC or UA in 2000)	7.94	1.000	0.09	83.72	2339.41	3393.39
Closest Urban is an Urbanized Area (LSAD 75)	2.08	0.889	0.04	47.44	7.37	8.75
2010 Population Density from 500 to under 1000 psm	2.71	0.938	0.1	27.59	12.36	18.16
2010 Population Density from 1000 to under 2000 psm	2.53	0.926	0.1	24.9	10.27	15.29
2010 Population Density from 2000 to under 4000 psm	2.57	0.929	0.09	27.4	10.91	15.77
2010 Population Density 4000 psm and over	4.2	0.985	0.09	48.08	56.24	79.22
Rural & Less than 1 Mile from Urban	5.53	0.996	0.09	62.09	211.87	300.41
Rural & Less than 2 Miles from Urban	3.91	0.980	0.1	39.65	41.19	60.64
Rural & Less than 4 Miles from Urban	2.45	0.921	0.1	23.3	9.39	14.17
Constant	-6.4	0.002	0.09	-71.82	0	0



Model Fit

X^2 (10) = 96981.88

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.93

Pseudo-R^2 (McFadden) = 0.86

AIC = 16248.48

BIC = 16351.14

Confusion Matrix & Statistics

Accuracy: 0.9615

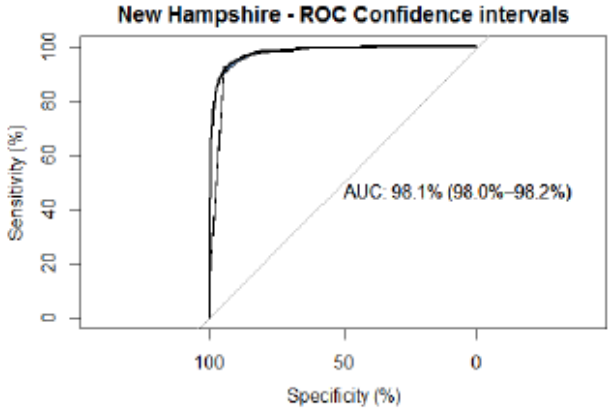
Sensitivity: 0.9656

Specificity: 0.9557

	Predicted: No	Predicted: Yes
Actual: No	47357	1526
Actual: Yes	1689	32937

B.29 New Hampshire

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Number of Jobs in Tract (Natural Log)	1.49	0.816	0.05	27.39	3.97	4.91
Urban (UC or UA in 2000)	5.64	0.996	0.06	88.02	248.61	319.62
Closest Urban is an Urbanized Area (LSAD 75)	1.36	0.796	0.05	30.2	3.58	4.27
2010 Population Density from 500 to under 1000 psm	1.48	0.815	0.07	20.73	3.82	5.06
2010 Population Density from 1000 to under 2000 psm	1.53	0.822	0.08	19.39	3.96	5.4
2010 Population Density from 2000 to under 4000 psm	2.22	0.902	0.09	23.51	7.65	11.08
2010 Population Density 4000 psm and over	2.45	0.921	0.09	28.04	9.8	13.82
Rural & Less than 1 Mile from Urban	2.81	0.943	0.06	44.7	14.65	18.74
Rural & Less than 2 Miles from Urban	0.79	0.688	0.1	7.74	1.81	2.71
Constant	-9.21	0.000	0.18	-50.2	0	0



Model Fit

X^2 (9) = 44215.01

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.85

Pseudo-R^2 (McFadden) = 0.74

AIC = 15360.54

BIC = 15447.66

Confusion Matrix & Statistics

Accuracy: 0.9352

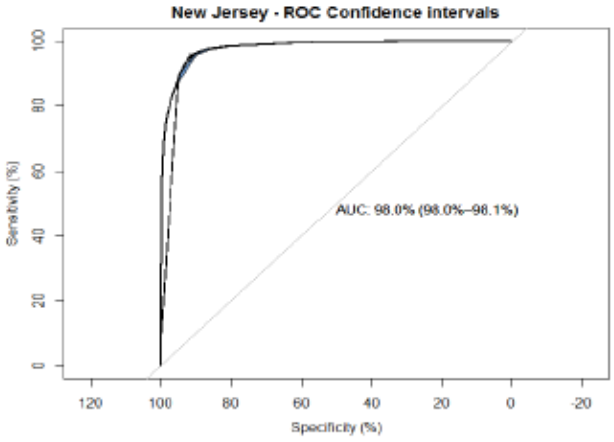
Sensitivity: 0.9515

Specificity: 0.9085

	Predicted: No	Predicted: Yes
Actual: No	26538	1555
Actual: Yes	1353	15441

B.30 New Jersey

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.58	0.171	0.07	-21.97	0.18	0.24
Number of Jobs in Tract (Natural Log)	0.42	0.603	0.03	14.59	1.44	1.62
Urban (UC or UA in 2000)	6.54	0.999	0.11	58.95	555.37	857.74
Closest Urban is an Urbanized Area (LSAD 75)	1.25	0.777	0.04	29.6	3.21	3.79
2010 Population Density from 500 to under 1000 psm	1.99	0.880	0.06	31.28	6.48	8.32
2010 Population Density from 1000 to under 2000 psm	2.24	0.904	0.07	34.36	8.3	10.72
2010 Population Density from 2000 to under 4000 psm	2.74	0.939	0.07	40.62	13.53	17.62
2010 Population Density 4000 psm and over	3.77	0.977	0.07	50.98	37.6	50.25
Rural & Less than 1 Mile from Urban	3.05	0.955	0.11	27.53	17.01	26.26
Rural & Less than 2 Miles from Urban	1.14	0.758	0.12	9.24	2.46	3.99
Rural & Less than 4 Miles from Urban	0.29	0.572	0.13	2.19	1.03	1.73
Constant	-5.99	0.002	0.15	-40.43	0	0



Model Fit

X^2 (11) = 96834.85

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.80

Pseudo-R^2 (McFadden) = 0.73

AIC = 36360.81

BIC = 36480.59

Confusion Matrix & Statistics

Accuracy: 0.9588

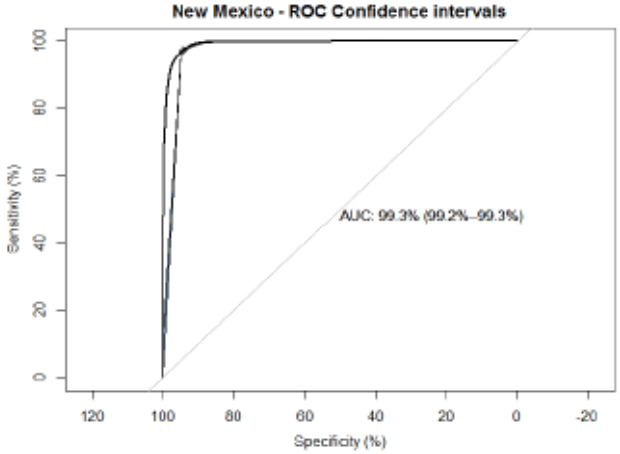
Sensitivity: 0.8794

Specificity: 0.9725

	Predicted: No	Predicted: Yes
Actual: No	20596	3753
Actual: Yes	2824	132617

B.31 New Mexico

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.44	0.192	0.09	-16.49	0.2	0.28
Number of Jobs in Tract (Natural Log)	0.57	0.639	0.02	23.23	1.69	1.86
Urban (UC or UA in 2000)	8.77	1.000	0.11	76.41	5151.5	8079.26
Closest Urban is an Urbanized Area (LSAD 75)	0.9	0.711	0.03	28.09	2.31	2.62
2010 Population Density from 500 to under 1000 psm	2.12	0.893	0.06	33.93	7.38	9.43
2010 Population Density from 1000 to under 2000 psm	2.44	0.920	0.07	35.83	10.03	13.09
2010 Population Density from 2000 to under 4000 psm	2.64	0.933	0.07	35.79	12.08	16.12
2010 Population Density 4000 psm and over	3.33	0.965	0.07	48.42	24.47	32.05
Rural & Less than 1 Mile from Urban	6.06	0.998	0.11	52.69	340.38	534.08
Rural & Less than 2 Miles from Urban	4.1	0.984	0.12	32.94	47.32	77.09
Rural & Less than 4 Miles from Urban	2.2	0.900	0.16	14.17	6.65	12.22
Constant	-8.95	0.000	0.14	-65.92	0	0



Model Fit

X^2 (11) = 160332.56

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.84

AIC = 31431.60

BIC = 31551.84

Confusion Matrix & Statistics

Accuracy: 0.9633

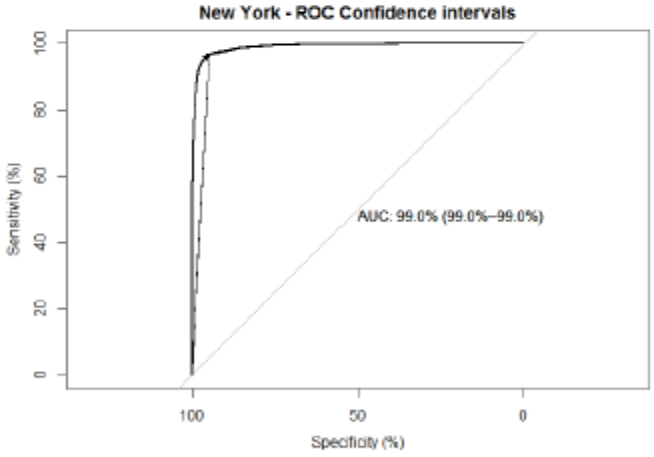
Sensitivity: 0.9759

Specificity: 0.9283

	Predicted: No	Predicted: Yes
Actual: No	119250	3143
Actual: Yes	2949	40717

B.32 New York

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.11	0.108	0.07	-30.76	0.11	0.14
Number of Jobs in Tract (Natural Log)	0.33	0.582	0.02	17.29	1.34	1.45
Urban (UC or UA in 2000)	6.97	0.999	0.04	162.96	975.73	1153.75
Closest Urban is an Urbanized Area (LSAD 75)	1.28	0.782	0.02	64.58	3.47	3.75
2010 Population Density from 500 to under 1000 psm	1.67	0.842	0.04	44.7	4.92	5.7
2010 Population Density from 1000 to under 2000 psm	1.88	0.868	0.04	45.92	6.04	7.09
2010 Population Density from 2000 to under 4000 psm	2.23	0.903	0.04	53.53	8.56	10.08
2010 Population Density 4000 psm and over	2.86	0.946	0.04	78.34	16.21	18.7
Rural & Less than 1 Mile from Urban	3.55	0.972	0.04	82.51	32.11	38.01
Rural & Less than 2 Miles from Urban	1.91	0.871	0.05	36.43	6.12	7.52
Rural & Less than 4 Miles from Urban	1.12	0.754	0.05	20.89	2.77	3.42
Constant	-6.26	0.002	0.07	-88.76	0	0



Model Fit

X^2 (11) = 377330.77

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.91

Pseudo-R^2 (McFadden) = 0.82

AIC = 82049.36

BIC = 82178.08

Confusion Matrix & Statistics

Accuracy: 0.9581

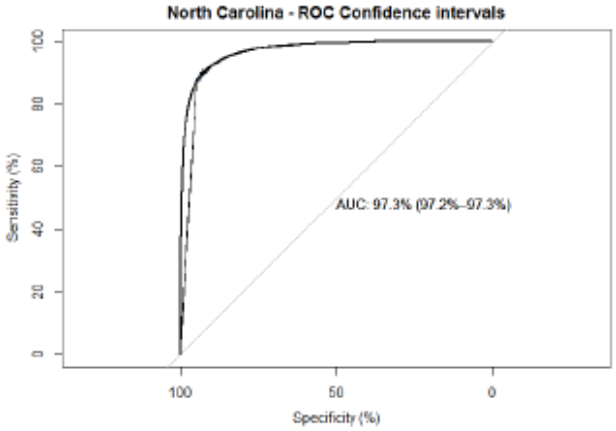
Sensitivity: 0.9594

Specificity: 0.9572

	Predicted: No	Predicted: Yes
Actual: No	137533	8283
Actual: Yes	5819	185103

B.33 North Carolina

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.07	0.112	0.05	-41.89	0.11	0.14
Number of Jobs in Tract (Natural Log)	0.69	0.666	0.02	42.31	1.94	2.06
Urban (UC or UA in 2000)	5.91	0.997	0.03	207.43	349.79	391.14
Closest Urban is an Urbanized Area (LSAD 75)	1.09	0.748	0.02	69.1	2.87	3.05
2010 Population Density from 500 to under 1000 psm	1.86	0.865	0.03	70.11	6.11	6.78
2010 Population Density from 1000 to under 2000 psm	2.13	0.894	0.03	77.98	7.98	8.88
2010 Population Density from 2000 to under 4000 psm	2.55	0.928	0.03	81.04	12.09	13.68
2010 Population Density 4000 psm and over	3.01	0.953	0.04	76.26	18.84	21.99
Rural & Less than 1 Mile from Urban	3.29	0.964	0.03	121.28	25.45	28.31
Rural & Less than 2 Miles from Urban	1.8	0.858	0.03	53.63	5.65	6.45
Rural & Less than 4 Miles from Urban	1.19	0.767	0.03	35.98	3.09	3.52
Constant	-6.26	0.002	0.06	-109.24	0	0



Model Fit

X^2 (11) = 265237.34

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.82

Pseudo-R^2 (McFadden) = 0.70

AIC = 116189.14

BIC = 116315.44

Confusion Matrix & Statistics

Accuracy: 0.9151

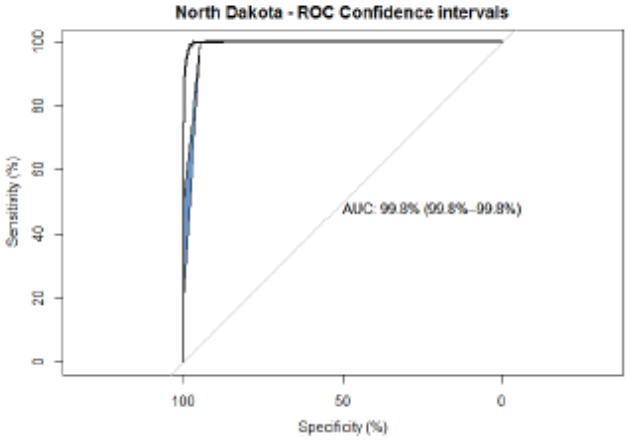
Sensitivity: 0.9257

Specificity: 0.9044

	Predicted: No	Predicted: Yes
Actual: No	127932	13084
Actual: Yes	10270	123842

B.34 North Dakota

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.5	0.076	0.2	-12.71	0.06	0.12
Number of Jobs in Tract (Natural Log)	1.31	0.788	0.07	19.04	3.25	4.26
Urban (UC or UA in 2000)	11.28	1.000	0.23	50.1	50828.4	122832.3
Closest Urban is an Urbanized Area (LSAD 75)	0.77	0.684	0.06	12.57	1.91	2.43
2010 Population Density from 500 to under 1000 psm	1.82	0.861	0.16	11.41	4.5	8.39
2010 Population Density from 1000 to under 2000 psm	2.4	0.917	0.17	13.79	7.86	15.57
2010 Population Density from 2000 to under 4000 psm	2.89	0.947	0.17	16.63	12.75	25.17
2010 Population Density 4000 psm and over	3.75	0.977	0.18	21.35	30.13	59.98
Rural & Less than 1 Mile from Urban	8.34	1.000	0.22	37.33	2695.46	6468.3
Rural & Less than 2 Miles from Urban	5.89	0.997	0.24	24.85	227.46	576.24
Rural & Less than 4 Miles from Urban	4.83	0.992	0.24	19.87	77.58	201.1
Constant	-12.95	0.000	0.31	-42.41	0	0



Model Fit

X^2 (11) = 80291.14

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.93

Pseudo-R^2 (McFadden) = 0.90

AIC = 8511.14

BIC = 8628.36

Confusion Matrix & Statistics

Accuracy: 0.9857

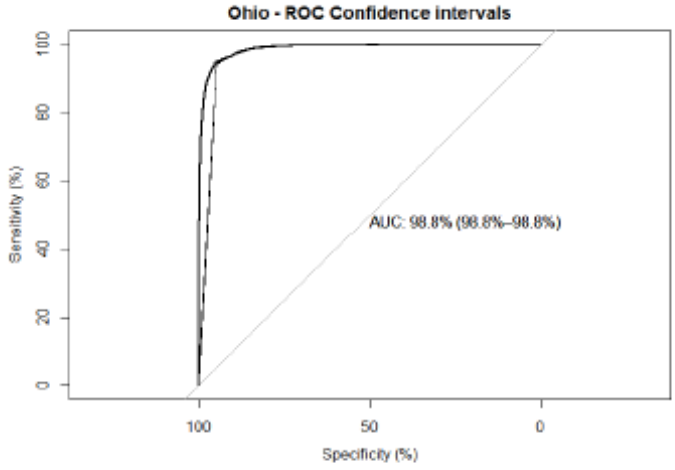
Sensitivity: 0.9919

Specificity: 0.9352

	Predicted: No	Predicted: Yes
Actual: No	114095	910
Actual: Yes	931	13128

B.35 Ohio

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.68	0.064	0.07	-38.61	0.06	0.08
Number of Jobs in Tract (Natural Log)	0.84	0.698	0.02	43.6	2.23	2.4
Urban (UC or UA in 2000)	8.49	1.000	0.07	122.45	4253.6	5582.32
Closest Urban is an Urbanized Area (LSAD 75)	1.34	0.792	0.02	76.47	3.69	3.95
2010 Population Density from 500 to under 1000 psm	1.8	0.858	0.04	45.99	5.58	6.5
2010 Population Density from 1000 to under 2000 psm	2.09	0.890	0.04	53.09	7.48	8.73
2010 Population Density from 2000 to under 4000 psm	2.41	0.918	0.04	66.44	10.41	12.01
2010 Population Density 4000 psm and over	2.8	0.943	0.03	85.56	15.41	17.52
Rural & Less than 1 Mile from Urban	5.46	0.996	0.07	78.41	205.65	270.23
Rural & Less than 2 Miles from Urban	3.18	0.960	0.08	42.2	20.72	27.84
Rural & Less than 4 Miles from Urban	2.39	0.916	0.07	32.23	9.47	12.67
Constant	-9.32	0.000	0.09	-102.96	0	0



Model Fit

X^2 (11) = 387931.18

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.80

AIC = 97630.59

BIC = 97759.84

Confusion Matrix & Statistics

Accuracy: 0.9473

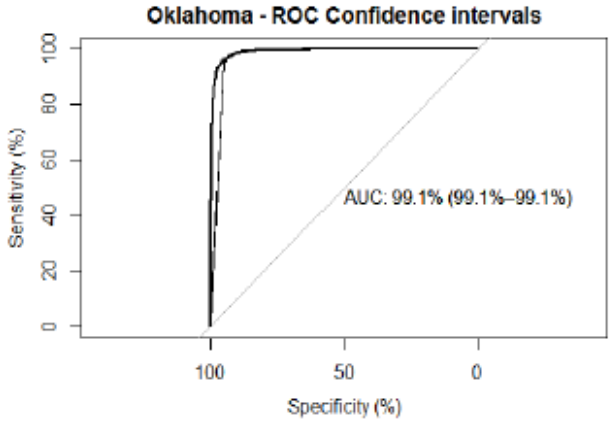
Sensitivity: 0.9446

Specificity: 0.9496

	Predicted: No	Predicted: Yes
Actual: No	153970	9497
Actual: Yes	9029	179090

B.36 Oklahoma

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.64	0.067	0.08	-32.17	0.06	0.08
Number of Jobs in Tract (Natural Log)	0.71	0.670	0.03	27.54	1.93	2.13
Urban (UC or UA in 2000)	7.64	1.000	0.05	158.47	1883.24	2274.74
Closest Urban is an Urbanized Area (LSAD 75)	1.66	0.840	0.03	60.6	4.99	5.55
2010 Population Density from 500 to under 1000 psm	1.92	0.872	0.05	36.44	6.12	7.53
2010 Population Density from 1000 to under 4000 psm	2.13	0.894	0.04	60.07	7.85	9.03
2010 Population Density 4000 psm and over	2.72	0.938	0.05	56.2	13.77	16.64
Rural & Less than 1 Mile from Urban	4.79	0.992	0.05	98.46	109.36	132.34
Rural & Less than 2 Miles from Urban	2.32	0.911	0.07	33.87	8.89	11.62
Rural & Less than 4 Miles from Urban	1.82	0.861	0.07	27.42	5.44	7.06
Constant	-7.96	0.000	0.09	-88.72	0	0



Model Fit

X^2 (10) = 260874.75

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.82

AIC = 56064.00

BIC = 56178.94

Confusion Matrix & Statistics

Accuracy: 0.9597

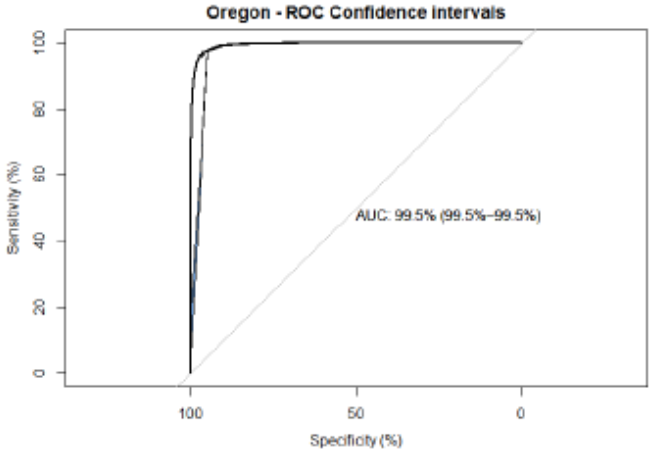
Sensitivity: 0.9718

Specificity: 0.9331

	Predicted: No	Predicted: Yes
Actual: No	170521	5333
Actual: Yes	4945	74375

B.37 Oregon

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.54	0.028	0.1	-36.62	0.02	0.04
Number of Jobs in Tract (Natural Log)	1.37	0.797	0.04	34.84	3.64	4.24
Urban (UC or UA in 2000)	7.47	0.999	0.06	119.87	1556.48	1987.34
Closest Urban is an Urbanized Area (LSAD 75)	1.25	0.777	0.03	39.12	3.28	3.72
2010 Population Density from 500 to under 1000 psm	2.46	0.921	0.06	38.1	10.3	13.26
2010 Population Density from 1000 to under 2000 psm	2.75	0.940	0.07	37.78	13.61	18.11
2010 Population Density from 2000 to under 4000 psm	3.02	0.953	0.07	41.03	17.76	23.7
2010 Population Density 4000 psm and over	3.7	0.976	0.06	60.22	35.7	45.41
Rural & Less than 1 Mile from Urban	4.7	0.991	0.06	75.21	96.85	123.7
Rural & Less than 2 Miles from Urban	2.73	0.939	0.08	33.38	13.12	18.09
Rural & Less than 4 Miles from Urban	1.27	0.781	0.09	13.66	2.98	4.3
Constant	-9.77	0.000	0.13	-72.79	0	0



Model Fit

X^2 (11) = 217617.49

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.93

Pseudo-R^2 (McFadden) = 0.87

AIC = 32913.44

BIC = 33035.40

Confusion Matrix & Statistics

Accuracy: 0.9683

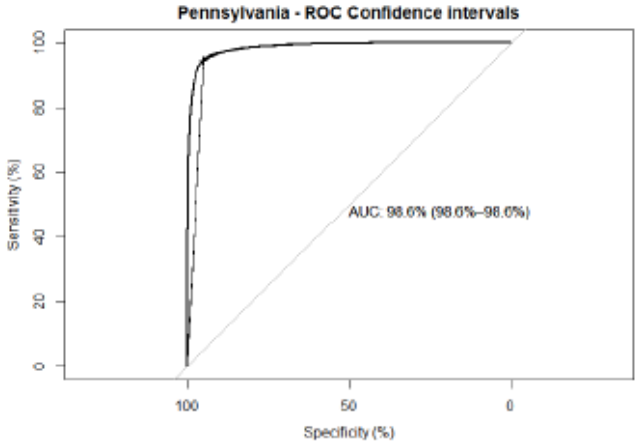
Sensitivity: 0.9758

Specificity: 0.9551

	Predicted: No	Predicted: Yes
Actual: No	119520	3103
Actual: Yes	2970	65989

B.38 Pennsylvania

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.39	0.033	0.06	-53.38	0.03	0.04
Number of Jobs in Tract (Natural Log)	0.41	0.601	0.02	23.4	1.45	1.55
Urban (UC or UA in 2000)	6.86	0.999	0.03	198.11	889.57	1018.87
Closest Urban is an Urbanized Area (LSAD 75)	0.88	0.707	0.02	53.91	2.34	2.5
2010 Population Density from 500 to under 1000 psm	1.98	0.879	0.03	63.71	6.79	7.67
2010 Population Density from 1000 to under 2000 psm	2.1	0.891	0.03	65.8	7.68	8.71
2010 Population Density from 2000 to under 4000 psm	2.37	0.915	0.03	74.71	10.02	11.34
2010 Population Density 4000 psm and over	2.8	0.943	0.03	99.72	15.63	17.46
Rural & Less than 1 Mile from Urban	3.58	0.973	0.03	103.5	33.38	38.22
Rural & Less than 2 Miles from Urban	1.91	0.871	0.04	46.62	6.21	7.29
Rural & Less than 4 Miles from Urban	0.57	0.639	0.04	13.09	1.63	1.93
Constant	-6.04	0.002	0.06	-98.61	0	0



Model Fit

X^2 (11) = 431087.59

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.88

Pseudo-R^2 (McFadden) = 0.79

AIC = 117942.51

BIC = 118073.48

Confusion Matrix & Statistics

Accuracy: 0.9475

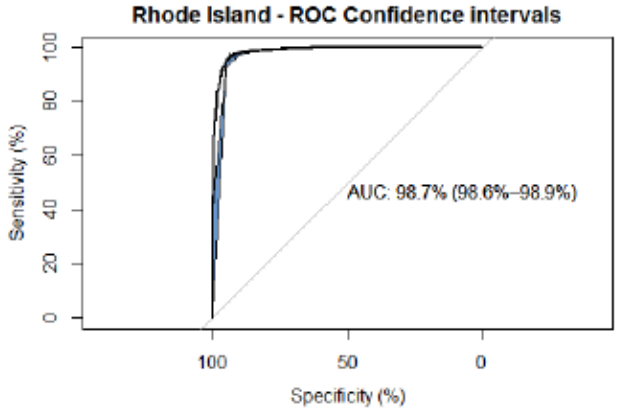
Sensitivity: 0.9477

Specificity: 0.9474

	Predicted: No	Predicted: Yes
Actual: No	156942	12648
Actual: Yes	8668	227764

B.39 Rhode Island

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.51	0.029	357.48	-0.06	0.02	0.06
Number of Jobs in Tract (Natural Log)	0.84	0.698	0.33	-10.58	1.9	2.79
Urban (UC or UA in 2000)	23.05	1.000	0.1	8.53	0	Inf
Closest Urban is an Urbanized Area (LSAD 75)	0.62	0.650	357.48	0.06	1.44	2.42
2010 Population Density from 500 to under 1000 psm	1.52	0.821	0.13	4.73	3.17	6.56
2010 Population Density from 1000 to under 4000 psm	1.55	0.825	0.19	8.2	3.58	6.15
2010 Population Density 4000 psm and over	3.13	0.958	0.14	11.18	14.31	36.83
Rural & Less than 1 Mile from Urban	19.26	1.000	0.24	12.99	0	Inf
Rural & Less than 2 Miles from Urban	15.57	1.000	357.48	0.05	0	Inf
Rural & Less than 4 Miles from Urban	0.06	0.515	357.48	0.04	0	Inf
Constant	-22.53	0.000	517.74	0	0	3.2E+294



Model Fit

X^2 (10) = 14704.56

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.85

Pseudo-R^2 (McFadden) = 0.79

AIC = 3940.49

BIC = 4029.12

Confusion Matrix & Statistics

Accuracy: 0.9696

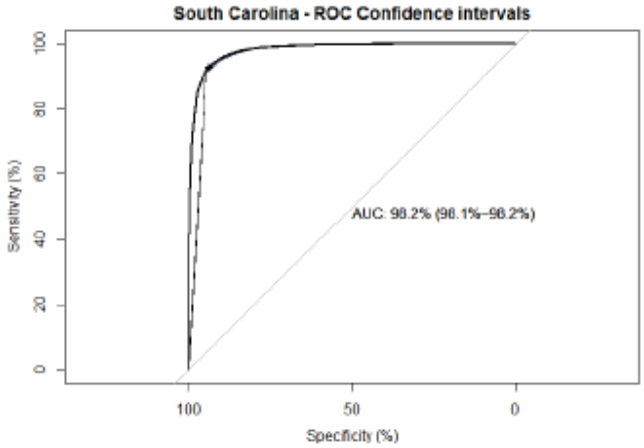
Sensitivity: 0.8860

Specificity: 0.9829

	Predicted: No	Predicted: Yes
Actual: No	2828	345
Actual: Yes	364	19789

B.40 South Carolina

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.65	0.066	0.08	-34.58	0.06	0.08
Number of Jobs in Tract (Natural Log)	0.76	0.681	0.02	31.67	2.04	2.24
Urban (UC or UA in 2000)	6.62	0.999	0.04	148.43	688.17	819.68
Closest Urban is an Urbanized Area (LSAD 75)	1.53	0.822	0.02	67.16	4.43	4.85
2010 Population Density from 500 to under 1000 psm	1.83	0.862	0.04	47.28	5.8	6.75
2010 Population Density from 1000 to under 2000 psm	1.92	0.872	0.04	48.79	6.3	7.35
2010 Population Density from 2000 to under 4000 psm	2.36	0.914	0.05	50.73	9.66	11.59
2010 Population Density 4000 psm and over	2.89	0.947	0.06	49.83	16.06	20.16
Rural & Less than 1 Mile from Urban	3.84	0.979	0.04	88.19	42.7	50.65
Rural & Less than 2 Miles from Urban	2.45	0.921	0.05	48.52	10.45	12.73
Rural & Less than 4 Miles from Urban	1.53	0.822	0.05	29.51	4.17	5.1
Constant	-7.27	0.001	0.08	-86.53	0	0



Model Fit

X^2 (11) = 178940.46

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.86

Pseudo-R^2 (McFadden) = 0.75

AIC = 59105.70

BIC = 59226.36

Confusion Matrix & Statistics

Accuracy: 0.9332

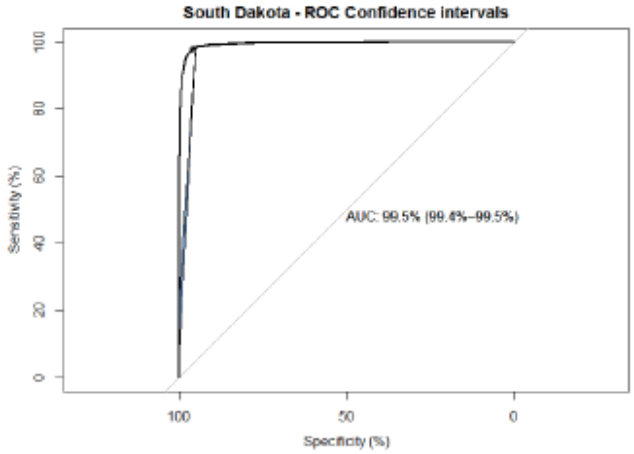
Sensitivity: 0.9358

Specificity: 0.9304

	Predicted: No	Predicted: Yes
Actual: No	84039	5719
Actual: Yes	5763	76422

B.41 South Dakota

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.2	0.100	0.18	-11.99	0.08	0.16
Number of Jobs in Tract (Natural Log)	0.34	0.584	0.05	6.85	1.28	1.55
Urban (UC or UA in 2000)	8.16	1.000	0.1	81.76	2890.41	4275.24
Closest Urban is an Urbanized Area (LSAD 75)	1.43	0.807	0.06	24.59	3.73	4.68
2010 Population Density from 500 to under 1000 psm	1.72	0.848	0.12	13.94	4.39	7.12
2010 Population Density from 1000 to under 2000 psm	1.82	0.861	0.11	16.23	4.95	7.67
2010 Population Density from 2000 to under 4000 psm	2.5	0.924	0.1	25.18	10	14.74
2010 Population Density 4000 psm and over	3.51	0.971	0.11	32.7	27.02	41.14
Rural & Less than 1 Mile from Urban	5.78	0.997	0.1	59.39	267.77	392.16
Rural & Less than 2 Miles from Urban	3.76	0.977	0.13	29.53	33.38	54.96
Rural & Less than 4 Miles from Urban	3.26	0.963	0.12	27.52	20.7	32.94
Constant	-7.55	0.001	0.18	-42.47	0	0



Model Fit

X^2 (11) = 62028.71

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.85

AIC = 10839.07

BIC = 10951.26

Confusion Matrix & Statistics

Accuracy: 0.9751

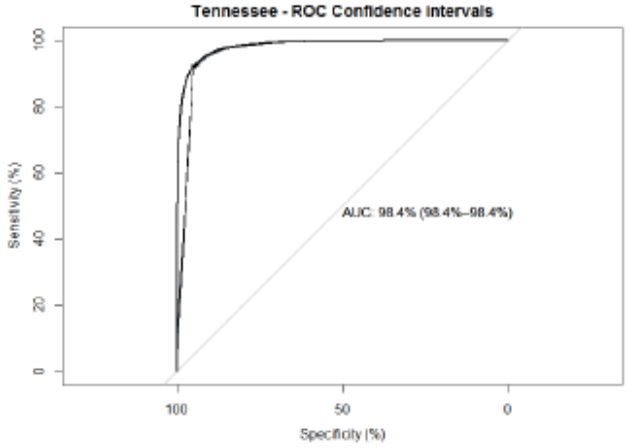
Sensitivity: 0.9872

Specificity: 0.9083

	Predicted: No	Predicted: Yes
Actual: No	70916	1196
Actual: Yes	920	11851

B.42 Tennessee

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.17	0.040	0.07	-43.07	0.04	0.05
Number of Jobs in Tract (Natural Log)	0.77	0.684	0.02	46.22	2.09	2.23
Urban (UC or UA in 2000)	6.42	0.998	0.04	169.34	572.15	663.88
Closest Urban is an Urbanized Area (LSAD 75)	1.36	0.796	0.02	68.09	3.76	4.06
2010 Population Density from 500 to under 1000 psm	1.83	0.862	0.04	51.14	5.83	6.7
2010 Population Density from 1000 to under 2000 psm	2.26	0.906	0.04	58.73	8.86	10.3
2010 Population Density from 2000 to under 4000 psm	2.77	0.941	0.04	63.25	14.6	17.33
2010 Population Density 4000 psm and over	3.31	0.965	0.06	59.88	24.69	30.67
Rural & Less than 1 Mile from Urban	3.63	0.974	0.04	98.9	35.27	40.73
Rural & Less than 2 Miles from Urban	1.91	0.871	0.05	42.05	6.2	7.41
Rural & Less than 4 Miles from Urban	1.08	0.746	0.05	22.69	2.69	3.24
Constant	-6.98	0.001	0.06	-113.17	0	0



Model Fit

X^2 (11) = 245128.59

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.87

Pseudo-R^2 (McFadden) = 0.77

AIC = 75009.87

BIC = 75134.26

Confusion Matrix & Statistics

Accuracy: 0.9373

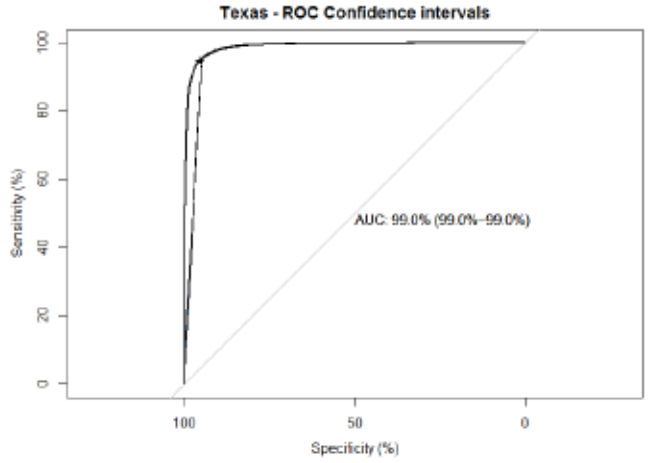
Sensitivity: 0.9516

Specificity: 0.9181

	Predicted: No	Predicted: Yes
Actual: No	127792	8205
Actual: Yes	6497	92005

B.43 Texas

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-1.5	0.182	0.03	-53.29	0.21	0.24
Number of Jobs in Tract (Natural Log)	0.53	0.629	0.01	49.36	1.66	1.73
Urban (UC or UA in 2000)	7.11	0.999	0.02	310.94	1172.03	1281.96
Closest Urban is an Urbanized Area (LSAD 75)	1.68	0.843	0.01	144.37	5.24	5.48
2010 Population Density from 500 to under 1000 psm	1.86	0.865	0.03	72.82	6.09	6.73
2010 Population Density from 1000 to under 2000 psm	2.22	0.902	0.02	90.11	8.77	9.66
2010 Population Density from 2000 to under 4000 psm	2.57	0.929	0.03	102.95	12.49	13.78
2010 Population Density 4000 psm and over	3.65	0.975	0.03	138.16	36.51	40.49
Rural & Less than 1 Mile from Urban	4.33	0.987	0.02	194.64	73.01	79.67
Rural & Less than 2 Miles from Urban	2.77	0.941	0.03	105.71	15.2	16.84
Rural & Less than 4 Miles from Urban	1.85	0.864	0.03	67.2	6.03	6.72
Constant	-6.92	0.001	0.04	-178.57	0	0



Model Fit

X^2 (11) = 991996.40

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.82

AIC = 223139.20

BIC = 223279.41

Confusion Matrix & Statistics

Accuracy: 0.9512

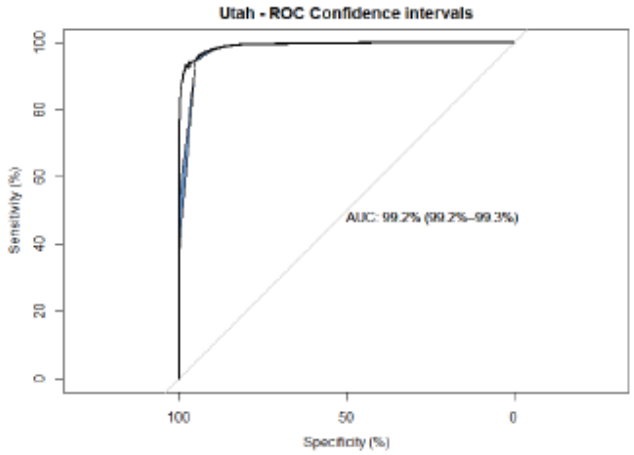
Sensitivity: 0.9474

Specificity: 0.9550

	Predicted: No	Predicted: Yes
Actual: No	414635	19729
Actual: Yes	23007	419148

B.44 Utah

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.46	0.079	0.11	-22.53	0.07	0.11
Number of Jobs in Tract (Natural Log)	0.26	0.565	0.03	8.58	1.23	1.38
Urban (UC or UA in 2000)	6.63	0.999	0.06	103.27	667.51	858.52
Closest Urban is an Urbanized Area (LSAD 75)	1.48	0.815	0.04	41.55	4.1	4.72
2010 Population Density from 500 to under 1000 psm	2.83	0.944	0.08	35.44	14.49	19.81
2010 Population Density from 1000 to under 2000 psm	3.39	0.967	0.08	44.45	25.49	34.37
2010 Population Density from 2000 to under 4000 psm	4.18	0.985	0.08	53.42	55.93	75.99
2010 Population Density 4000 psm and over	5.11	0.994	0.09	59.63	140.52	196.66
Rural & Less than 1 Mile from Urban	4.07	0.983	0.06	71.82	52.63	65.74
Rural & Less than 2 Miles from Urban	2.25	0.905	0.08	29.21	8.15	11.03
Rural & Less than 4 Miles from Urban	0.69	0.666	0.1	6.97	1.64	2.43
Constant	-5.92	0.003	0.11	-53.95	0	0



Model Fit

X^2 (11) = 126020.03

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.91

Pseudo-R^2 (McFadden) = 0.84

AIC = 24344.42

BIC = 24460.16

Confusion Matrix & Statistics

Accuracy: 0.9589

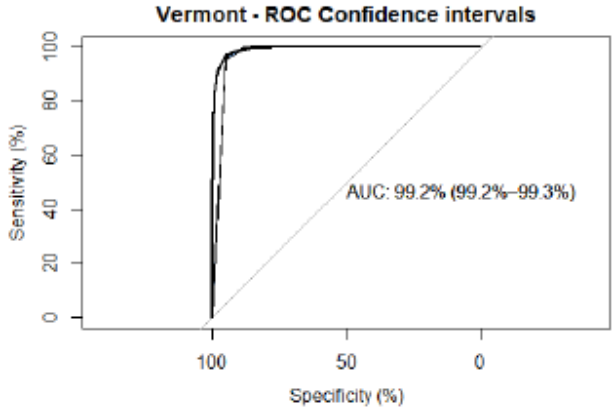
Sensitivity: 0.9732

Specificity: 0.9346

	Predicted: No	Predicted: Yes
Actual: No	70054	2756
Actual: Yes	1931	39397

B.45 Vermont

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-6.76	0.001	198.87	-0.12	0	0
Number of Jobs in Tract (Natural Log)	0.66	0.659	0.4	-16.82	1.6	2.35
Urban (UC or UA in 2000)	23.14	1.000	0.1	6.79	0	2.1E+179
Closest Urban is an Urbanized Area (LSAD 75)	1.38	0.799	198.87	0.12	3.29	4.81
2010 Population Density from 500 to under 1000 psm	2.07	0.888	0.1	14.25	5.98	10.61
2010 Population Density from 1000 to under 4000 psm	2.45	0.921	0.15	14.17	9.18	14.73
2010 Population Density 4000 psm and over	2.67	0.935	0.12	20.31	10.26	20.36
Rural & Less than 1 Mile from Urban	20.25	1.000	0.17	15.28	0	1.2E+178
Rural & Less than 2 Miles from Urban	18.34	1.000	198.87	0.1	0	1.8E+177
Rural & Less than 4 Miles from Urban	16.82	1.000	198.87	0.09	0	3.9E+176
Constant	-23.53	0.000	198.87	0.08	0	1.2E+159



Model Fit

X^2 (10) = 22177.72

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.88

Pseudo-R^2 (McFadden) = 0.82

AIC = 4940.00

BIC = 5030.79

Confusion Matrix & Statistics

Accuracy: 0.9662

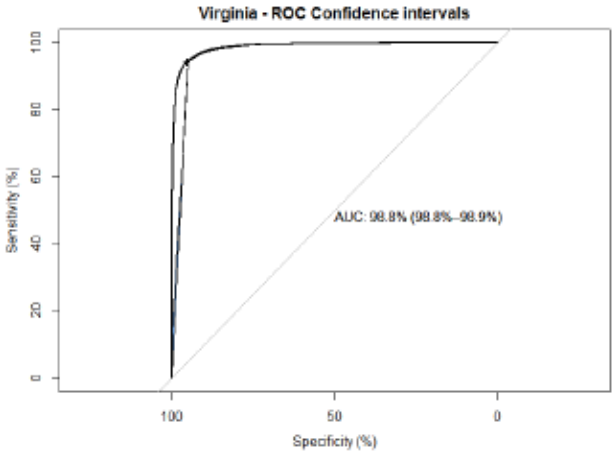
Sensitivity: 0.9804

Specificity: 0.9032

	Predicted: No	Predicted: Yes
Actual: No	22723	505
Actual: Yes	455	4714

B.46 Virginia

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.93	0.019	0.07	-55.98	0.02	0.02
Number of Jobs in Tract (Natural Log)	0.67	0.662	0.02	32.88	1.87	2.03
Urban (UC or UA in 2000)	6.84	0.999	0.04	176.42	870.27	1013.22
Closest Urban is an Urbanized Area (LSAD 75)	1.46	0.812	0.02	69	4.14	4.5
2010 Population Density from 500 to under 1000 psm	1.56	0.826	0.04	37.35	4.38	5.16
2010 Population Density from 1000 to under 2000 psm	1.94	0.874	0.04	44.75	6.38	7.56
2010 Population Density from 2000 to under 4000 psm	2.43	0.919	0.05	53	10.37	12.42
2010 Population Density 4000 psm and over	2.86	0.946	0.04	64.79	15.98	19
Rural & Less than 1 Mile from Urban	3.84	0.979	0.04	101.62	43.01	49.87
Rural & Less than 2 Miles from Urban	2.36	0.914	0.05	51.44	9.7	11.61
Rural & Less than 4 Miles from Urban	1.48	0.815	0.05	30.73	3.99	4.82
Constant	-6.93	0.001	0.07	-93.51	0	0



Model Fit

X^2 (11) = 289771.71

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.89

Pseudo-R^2 (McFadden) = 0.80

AIC = 70708.73

BIC = 70834.50

Confusion Matrix & Statistics

Accuracy: 0.9493

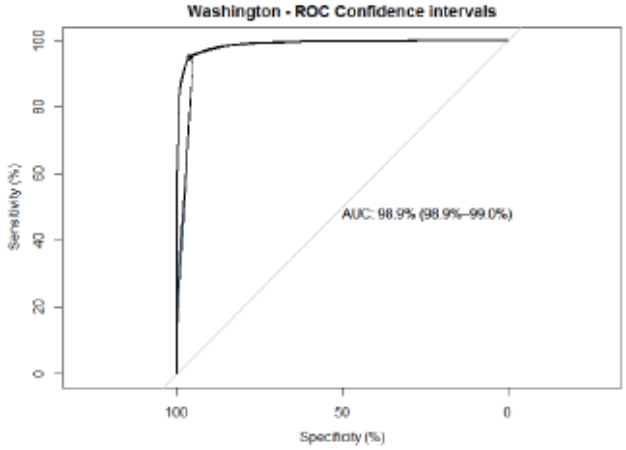
Sensitivity: 0.9576

Specificity: 0.9386

	Predicted: No	Predicted: Yes
Actual: No	142203	7040
Actual: Yes	6298	107621

B.47 Washington

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-2.2	0.100	0.07	-33.18	0.1	0.13
Number of Jobs in Tract (Natural Log)	0.78	0.686	0.03	28.25	2.07	2.31
Urban (UC or UA in 2000)	6.82	0.999	0.04	152.27	839.38	1000.48
Closest Urban is an Urbanized Area (LSAD 75)	1.19	0.767	0.03	45.51	3.13	3.47
2010 Population Density from 500 to under 1000 psm	2.06	0.887	0.05	42.22	7.15	8.65
2010 Population Density from 1000 to under 2000 psm	2.27	0.906	0.05	42.46	8.72	10.75
2010 Population Density from 2000 to under 4000 psm	2.78	0.942	0.05	52.7	14.6	17.95
2010 Population Density 4000 psm and over	3.71	0.976	0.05	73.91	36.89	44.9
Rural & Less than 1 Mile from Urban	3.74	0.977	0.04	85.95	38.66	45.85
Rural & Less than 2 Miles from Urban	1.89	0.869	0.06	31.15	5.86	7.43
Rural & Less than 4 Miles from Urban	1.27	0.781	0.06	21.32	3.16	3.99
Constant	-7.16	0.001	0.1	-73.71	0	0



Model Fit

X^2 (11) = 204602.91

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.81

AIC = 46840.86

BIC = 46962.29

Confusion Matrix & Statistics

Accuracy: 0.9545

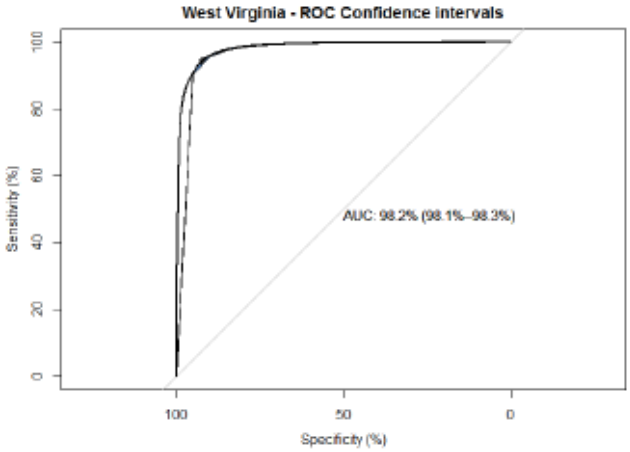
Sensitivity: 0.9569

Specificity: 0.9527

	Predicted: No	Predicted: Yes
Actual: No	76880	4878
Actual: Yes	3462	98175

B.48 West Virginia

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-4.63	0.010	0.11	-42.97	0.01	0.01
Number of Jobs in Tract (Natural Log)	0.62	0.650	0.03	20.85	1.76	1.98
Urban (UC or UA in 2000)	7.17	0.999	0.06	112.58	1148.69	1474.51
Closest Urban is an Urbanized Area (LSAD 75)	0.36	0.589	0.03	13.15	1.36	1.52
2010 Population Density from 500 to under 1000 psm	1.48	0.815	0.05	28.89	3.99	4.88
2010 Population Density from 1000 to under 2000 psm	1.64	0.838	0.05	32.09	4.67	5.71
2010 Population Density from 2000 to under 4000 psm	1.72	0.848	0.05	33.37	5.03	6.16
2010 Population Density 4000 psm and over	2.07	0.888	0.05	42.85	7.19	8.69
Rural & Less than 1 Mile from Urban	4.52	0.989	0.06	71.88	81.2	103.89
Rural & Less than 2 Miles from Urban	3.16	0.959	0.07	44.48	20.58	27.2
Rural & Less than 4 Miles from Urban	2.29	0.908	0.07	32.28	8.59	11.35
Constant	-6.92	0.001	0.11	-64.42	0	0



Model Fit

X^2 (11) = 117809.01

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.85

Pseudo-R^2 (McFadden) = 0.75

AIC = 39863.14

BIC = 39980.04

Confusion Matrix & Statistics

Accuracy: 0.9379

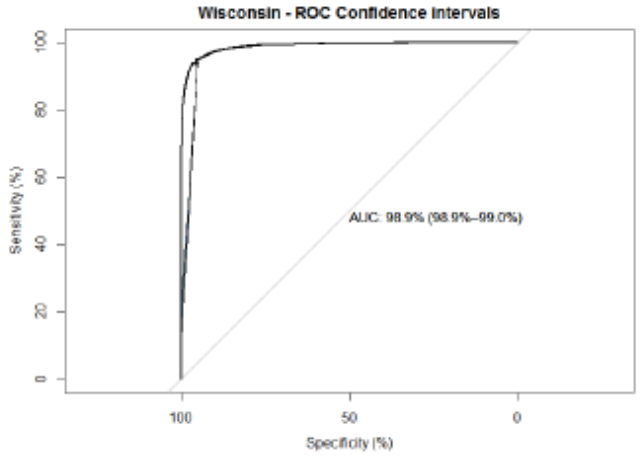
Sensitivity: 0.9662

Specificity: 0.8775

	Predicted: No	Predicted: Yes
Actual: No	82652	4926
Actual: Yes	2890	35299

B.49 Wisconsin

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-3.45	0.031	0.08	-41.88	0.03	0.04
Number of Jobs in Tract (Natural Log)	0.6	0.646	0.02	24.36	1.74	1.91
Urban (UC or UA in 2000)	6.91	0.999	0.04	175.19	923.48	1077.78
Closest Urban is an Urbanized Area (LSAD 75)	1	0.731	0.02	43.67	2.59	2.83
2010 Population Density from 500 to under 1000 psm	2.25	0.905	0.05	47.15	8.61	10.38
2010 Population Density from 1000 to under 2000 psm	2.44	0.920	0.05	52.91	10.52	12.6
2010 Population Density from 2000 to under 4000 psm	2.88	0.947	0.04	66.06	16.4	19.46
2010 Population Density 4000 psm and over	3.17	0.960	0.04	71.43	21.82	25.96
Rural & Less than 1 Mile from Urban	4.05	0.983	0.04	109.12	53.6	62.01
Rural & Less than 2 Miles from Urban	1.49	0.816	0.06	24.05	3.93	5.01
Rural & Less than 4 Miles from Urban	1.07	0.745	0.06	19.41	2.62	3.25
Constant	-6.65	0.001	0.08	-79.26	0	0



Model Fit

X^2 (11) = 252287.16

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.90

Pseudo-R^2 (McFadden) = 0.81

AIC = 58442.53

BIC = 58566.79

Confusion Matrix & Statistics

Accuracy: 0.9537

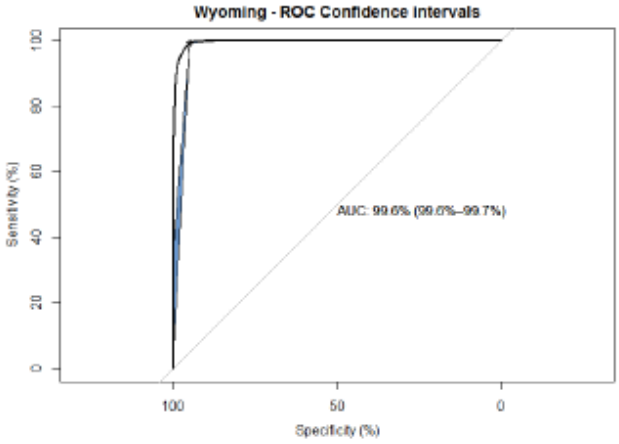
Sensitivity: 0.9705

Specificity: 0.9274

	Predicted: No	Predicted: Yes
Actual: No	137391	6587
Actual: Yes	4169	84088

B.50 Wyoming

Regression Variables	EST.	Probability	S.E.	Z-VALUE	2.5% CI	97.5% CI
Distance to Roads (Natural Log)	-4.66	0.009	0.24	-19.77	0.01	0.02
Number of Jobs in Tract (Natural Log)	0.81	0.692	0.07	11.16	1.95	2.6
Urban (UC or UA in 2000)	24.63	1.000	168.56	0.15	0	1.5E+154
Closest Urban is an Urbanized Area (LSAD 75)	0.46	0.613	0.06	7.81	1.41	1.78
2010 Population Density from 500 to under 1000 psm	1.93	0.873	0.14	13.81	5.25	9.08
2010 Population Density from 1000 to under 2000 psm	2.55	0.928	0.15	16.66	9.51	17.35
2010 Population Density from 2000 to under 4000 psm	2.59	0.930	0.14	18.32	10.07	17.52
2010 Population Density 4000 psm and over	3.76	0.977	0.14	26.09	32.51	57.24
Rural & Less than 1 Mile from Urban	21.86	1.000	168.56	0.13	0	9.3E+152
Rural & Less than 2 Miles from Urban	19.04	1.000	168.56	0.11	0	5.6E+151
Rural & Less than 4 Miles from Urban	18.47	1.000	168.56	0.11	0	3.1E+151
Constant	-24.89	0.000	168.56	-0.15	0	4.6E+132



Model Fit

X^2 (11) = 71988.86

p = 0.00

Pseudo-R^2 (Cragg-Uhler) = 0.92

Pseudo-R^2 (McFadden) = 0.88

AIC = 10099.77

BIC = 10211.85

Confusion Matrix & Statistics

Accuracy: 0.9747

Sensitivity: 0.9873

Specificity: 0.9216

	Predicted: No	Predicted: Yes
Actual: No	67172	1261
Actual: Yes	863	14814

REFERENCES

Boustan, L.P., Bunten, D., Hearey, O., (2013). Urbanization in the United States, 1800-2000 (Working Paper). Retrieved from https://www.library.cornell.edu/sites/default/files/apa.pdf

Douthat, T.H., Garrow, L., Nord, A.H., (2018). Transit Planning Challenges from "Trending Urban" on the Ever Expanding Urban-Rural Fringe: A Case Study from Georgia, USA (Working Paper). Georgia Institute of Technology, School of Civil and Environmental Engineering. Atlanta, Georgia, USA.

Environmental Systems Research Institute (ESRI) (2017). ArcGIS Release 10.5.1. Redlands, California.

Environmental Systems Research Institute (ESRI) (2015). 2015/2020 Population Projections. Retrieved from https://support.esri.com/en/white-paper/2219

Federal Transit Administration (FTA). (2018). 20. Section 5311 program requirements. Retrieved from https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/regulations-and-guidance/safety/triennial-reviews/69531/fy18-comprehensive-review-guide-section-20-section-5311-program-requirements.pdf

Federal Transit Administration (FTA). (2015). Census 2010 and FTA formula grants. Retrieved from https://www.transit.dot.gov/sites/fta.dot.gov/files/Census%202010%20and%20FTA%20Formula%20Grants%2012-7-15.pdf

Federal Transit Administration (FTA). (n.d.). Grant programs. Retrieved from https://www.transit.dot.gov/grants

Federal Transit Administration (FTA). (n.d.). Rural transportation assistance program – 5311(b)(3). Retrieved from https://www.transit.dot.gov/funding/grants/rural-transportation-assistance-program-5311b3

Federal Transit Administration (FTA). (2017). National transit database policy manual. Retrieved from

https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/ntd/57981/2017-ntd-policy-manual_2.pdf

Green, J., and Mahomoui, D. (2017). lehdr: Grab LEHD Flat Files. R package. Retrieved from https://rdrr.io/github/jamgreen/lehdR/

Kuhn, M. Wing, J., Weston, S., Williams, A., Keefer, C., Engelhardt, A., Cooper, T., Mayer, Z., Kenkel, B., the R Core Team, Benesty, M., Lescarbeau, R., Ziem, A., Scrucca, L.,Tang, Y., Candan, C., and Hunt, H. (2018). caret: Classification and Regression Training.R package version 6.0-80. Retrieved from https://CRAN.R-project.org/package=caret

Long JA (2018). jtools: Analysis and Presentation of Social Scientific Data. R package version 1.0.0. Retrieved from https://cran.r-project.org/package=jtools.

Manson, S., Schroeder, J., Van Riper, D., & Ruggles, S. (2017). IPUMS national historical Geographic Information System: Version 12.0 (Database). Minneapolis: University of Minnesota. doi:10.18128/D050.V12.0

Nord, A. H. (2018). A Statewide Assessment of Areas Trending Urban in Georgia and the Implications for Transit Funding (master's thesis). Georgia Institute of Technology, Atlanta, Georgia, USA.

Pebesma, E. (2018). sf: Simple Features for R. R package version 0.6-3. Retrieved from https://CRAN.R-project.org/package=sf

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from https://www.R-project.org/.

Ratcliffe, M., Burd, C., Holder, K., Fields, A. (2016). Defining rural at the U.S. census bureau: American community survey and geography brief. Retrieved from https://www2.census.gov/geo/pdfs/reference/ua/Defining_Rural.pdf

Robin, X., Turck, N., Hainard, A., Tiberti, N., Lisacek, F, Sanchez, JC., and Müller, M. (2011). pROC: an open-source package for R and S+ to analyze and compare ROC curves. BMC Bioinformatics, 12, p. 77. DOI: 10.1186/1471-2105-12-77. Retrieved from http://www.biomedcentral.com/1471-2105/12/77/

Smith, S. K., Tayman, J., Swanson, D. A. (2001). State and Local Population Projections, Methodology and Analysis. New York, NY: Kluwer Academic/Plenum Publishers.

Stapel, E. (2012). Exponential Functions: Compound Interest. Retrieved from https://www.purplemath.com/modules/expofcns4.htm.

Tape, T.G. (n.d.) Interpreting diagnostic tests. Retrieved from http://gim.unmc.edu/dxtests/Default.htm

UCLA, Institute for Digital Research and Education. (2011, October 20). Retrieved from https://stats.idre.ucla.edu/other/mult-pkg/faq/general/faq-what-are-pseudo-r-squareds/

Urban Area Criteria for Census – 2000 Proposed Criteria. 76 Fed. Reg. 53032-53034 (August 24, 2011). Retrieved from https://www2.census.gov/geo/pdfs/reference/fedreg/fedregv76n164.pdf

US Bureau of Economic Analysis (BEA), "SA25N Total Full-Time and Part-Time Employment by NAICs Industry 1". (2017). Retrieved from https://apps.bea.gov/

US Census Bureau. (2001). Census 2000 Summary File 1, United States. Prepared by NHGIS: https://www.nhgis.org.

US Census Bureau. (2015). 2010 census tallies of census tracts, block groups & blocks. Retrieved from https://www.census.gov/geo/maps-data/data/tallies/tractblock.html

US Census Bureau. (2011). Census 2010 Summary File 1, United States. Prepared by NHGIS: https://www.nhgis.org.

US Census Bureau. (2011). Population Distribution and Change 2000 to 2010. Retrieved from https://www.Census.gov/prod/cen2010/briefs/c2010br-01.pdf.

Walker, A. (2018). openxlsx: Read, Write and Edit XLSX Files. R package version 4.1.0. Retrieved from https://CRAN.R-project.org/package=openxlsx.

Walker, K. (2018). tigris: Load Census TIGER/Line Shapefiles. R package version 0.7. https://github.com/walkerke/tigris

Wickham, H. (2018). stringr: Simple, Consistent Wrappers for Common String Operations. R package version 1.3.1. Retrieved from https://CRAN.R-project.org/package=stringr

Wickham, H., François, R., Henry, L., and Müller, K. (2018). dplyr: A Grammar of Data Manipulation. R package version 0.7.5. Retrieved from https://CRAN.R-project.org/package=dplyr.

Wickham, H., Hester, J., and Chang, W. (2018). devtools: Tools to Make Developing R Packages Easier. R package version 1.13.5. Retrieved from https://CRAN.R-project.org/package=devtools